Ministry of Information

Projects & Engineering Research Department

DESIGN, SUPPLY, INSTALLATION, TESTING, TRAINING COMMISSIONING, WARRANTY & MAINTENANCE OF MOInfo FIBRE NETWORK

1. GENERAL 5

1.1. PURPOSE OF THE RFP 5
1.2. PROJECT OVERVIEW 5
1.3. GOALS AND OBJECTIVES 6
1.4. ANTICIPATED PROJECT TIME FRAME 6
1.5. BIDDER RESPONSE 7
1.6. QUESTIONS RELATING TO THE RFP 8
1.7. SUBMISSION OF PROPOSALS 8
1.8. SELECTION PROCESS & EVALUATION CRITERIA 8
1.9. BIDDER PRESENTATION 9
1.10. OFFER VALIDITY 9
1.11. MAIN TASKS AND RESPONSIBILITIES 9
1.12. MAINTENANCE AND SUPPORT 10
1.12.1. GENERAL REQUIREMENTS 10
1.12.2. SYSTEM ACCEPTANCE 11
1.13. TRAINING 12
1.14. MISCELLANEOUS 14
1.14.1. QUALITY ASSURANCE 14
1.14.2. BIDDER QUALIFICATIONS 14
1.14.3. REFERENCE LIST 15
1.14.4. CONTACT POINT 15
1.14.5. COMPANY GENERAL INFORMATION 15
1.15. SCOPE OF WORK 15
1.16. INSURANCE 17
1.17. AS-BUILT DRAWINGS, MANUALS, AND CATALOGUE 17
1.18. COMPLIANCE 17
1.19. SELECTION, REJECTION, ADDITION AND/OR MODIFICATION 18
1.13 PRELIMINARY/PROVISIONAL HANDING OVER CERTIFICATE (PHOC) 18
1.20. FINAL HANDING OVER CERTIFICATE (FHOC) 18
1.21. ENVIRONMENTAL CONDITIONS 18

2. OPTICAL FIBRE CABLE PLANT 19

2.1. THE BIDDER SHALL INCLUDE IN HIS BID THE QUANTITIES OF THE FOLLOWING : 19
2.2. AFTER CONTRACT SIGNING THE CONTRACTOR SHALL FINALIZE HIS SURVEY AND SUBMIT REPORT SHOWING FINAL LENGTH (DISTANCE). 19

3. OPTICAL FIBER CABLE SPECIFICATIONS 19

3.1. FIBER OPTIC CABLE SPECIFICATIONS 20
3.1.1. CABLE DESCRIPTION 20

3.1.2. QUALITY 20
3.1.3. RELIABILITY 20
3.2. CABLE DESIGN 21
3.2.1. GENERAL 21
3.2.2. DUAL JACKET-ARMOURED 21
3.2.3. MARKINGS 21
3.3. TYPE TESTING 22
3.3.1. MECHANICAL CHARACTERISTICS 22
3.3.2. TESTING & INSPECTION 22

4. TRANSMISSION EQUIPMENT 22

4.1. OVERVIEW & INTRODUCTION 22
4.2. CORE ROUTERS SPECIFICATIONS 24
4.3. ACCESS ROUTERS 28
4.4. APPLIED STANDARDS 28
4.5. SERVICE INTERFACES 29
4.6. MULTI-SERVICE SUPPORT 30
4.7. EQUIPMENT AND NETWORK PROTECTION 31
4.8. OPTICAL ADAPTABILITY 32

5. NETWORK MANAGEMENT SYSTEM 32

5.1. HARDWARE 35
5.1.1. POWER SUPPLY 36
5.1.2. CONSOLE FURNITURE 36
5.1.3. REPORTS 36

6. DISASTER RECOVERY SYSTEM (DRS) 37

7. CODEC'S SYSTEM (ENCODING SYSTEM OR HEAD END) 39

7.1. GENERAL REQUIREMENT 39
7.2. CODEC'S SPECIFICATION 41
7.3. ENCODER 44
7.4. DECODER 44
7.5. IP MULTIPLEXER 45

8. POWER EQUIPMENT 45

8.1. GENERAL REQUIREMENT 45
8.1.1. DC POWER GENERAL REQUIREMENT 46
8.1.2. DC SYSTEM DESIGN 46

8.1.3. RECTIFIER DESIGN 46
8.1.4. RECTIFIER PERFORMANCE 47
8.1.5. RECTIFIER INDICATOR 48
8.1.6. POWER DISTRIBUTION PANEL 48
8.1.7. LOW - VOLTAGE DISCONNECT 49
8.1.8. BATTERY DISCONNECT BREAKER 50
8.1.9. BATTERY EQUALIZATION 50
8.1.10. BATTERY TYPE: 50
8.1.11. BATTERY INSTALLATION 50
8.1.12. BATTERY CABLING 50
8.1.13. CONDUCTOR PROTECTION 50
8.1.14. UPS POWER SYSTEM SPECIFICATION 50

9. INSTALLATION WORK 52

9.1. GENERAL 52
9.2. TOOLS AND TESTING EQUIPMENT 53
9.3. SUPPLY AND APPROVAL 53
9.4. QUALITY OF MATERIAL 53
9.5. CABLES AND WIRES 53
9.6. INTERFACE CONNECTORS 54
9.7. CABLE RUNWAY 54
9.8. DISTRIBUTION FRAMES 54
9.9. LIGHTING ON THE RACKS 54
9.10. ELECTRIC OUTLETS 54
9.11. SIGN-WRITING AND LABELING 55
9.12. EQUIPMENT EARTHING 55
9.13. PORTABLELADDERS & STOOLS 55
9.14. EQUIPMENT LAYOUT 55
9.14.1. GENERAL 55
9.15. CABLE LAYOUT 55
9.15.1. HAND-HOLES, MANHOLES & ROAD CROSSING DUCTS 55
9.15.2. INNER-DUCTS 56
9.15.3. WARNING TAPE 56
9.15.4. BURIED CABLE WARNING POSTS 56
9.16. PROJECT IMPLEMENTATION 57
9.16.1. SURVEY 57
9.16.2. FIELD SURVEY FOR BURIED CABLE 57
9.16.3. EXCAVATION AND EARTH WORKS 58
9.16.4. LAYING OF UPVC PIPES 59
9.16.5. LAYING OF CABLE 60
9.16.6. BACKFILLING OF THE TRENCH 61
9.16.7. CABLE INSTALLATION 61

10. TESTING 62

10.1. ACCEPTANCE TESTING FOR OPTICAL FIBRE CABLE 62
10.2. TESTING OF INSTALLED OPTICAL FIBRE CABLE 63
10.3. TEST PROGRAM 64
10.3.1. DESIGN VERIFICATION AND FACTORY TESTS 64
10.3.2. INSTALLATION VERIFICATION TESTS 64
10.3.3. SYSTEM ACCEPTANCE TESTS 64
10.4. TEST PLAN 64
10.5. TEST SCHEDULE 65
10.6. INDIVIDUAL TEST PROCEDURES 65
10.7. TEST DATA SHEETS 66
10.8. TEST RESULTS 66

11. SPARES & TOOLS 67

12. DOCUMENTATION 67

13. BILLS OF QUANTITIES (B O Q)& PRICE SCHEDULE 69

APPENDIX A: SITES 71

APPENDIX B: STANDARDS 72

APPENDIX C: MAP 77

1. General

1.1. Purpose of the RFP

The purpose of this Request For Proposal (RFP) document is to invite qualified Bidders to submit proposals for suitable, cost effective solutions for MOInfo for the Implementation and Support of a Broadcast fiber network for Ministry of Information.

The main objective for MOInfo is to evaluate and select Bidder products & services based on the responses to this RFP and award contract(s) to the successful Bidder(s) for deployment.

1.2. Project Overview

The Ministry Of Information seeks to build a state of the art Fiber optic network to connect all MOInfo sites the Master Control room in MOInfo's main building complex.

This document describes the system requirements for development of MOInfo's Broadcast network based on leading fiber optic network technologies. It includes a set of solution requirements that will enable MOInfo to appropriately control and manage broadcast traffic between various sites.

Management systems are requested and should be capable of handling current and future services. MOInfo is currently running network based on SDH transport. The solutions required in this document shall be based on an IP. The new fiber optic network will be the platform which will provide required bandwidth to/from all locations connected to the network.

The scope of this RFP is three-fold:

1. Build a broadcast fiber optic Network with all the required functionality and systems to transport and manage broadcast traffic to/from all locations mentioned in this RFP. The Network to be implemented shall cover the following functions:

    a. Fiber optic network based on latest IP technologies
    b. A/V mulitplexers support all codecs
    c. Network management systems
2. Design the network to be fully redundant without any single points of failure throughout the defined scope of delivery.
3. Ensure operation of supplied systems by providing required support and training. The Bidder is expected transfer sufficient system knowledge to the MOInfo team through theoretical and practical training.

Information on locations to be connected to the network is is included in the appendix.

Only products of the European, North American & Japanese origin will be accepted. The bidder is obliged to comply with and obtain all required approvals from the following governmental entities during the project execution:

- ITU Recommendations & Standards .
- Ministry of Communications (M.O.C) Regulations
- Ministry of public works (MPW).
- Kuwait Municipality .
- Ministry of Electricity & Water (M.O.E.W) Regulations.
- Ministry of Interior (MOI)

All required approvals for deployement of the network from various government agencies external to the MOInfo must be co-ordinated with relevant government agencies and is solely the responsibility of the bidder.

1.3. Goals and objectives

Key project objective is to help MOInfo to transport broadcast traffic to/from all locations listed in the appendix to the MOInfo's master control room. The Ministry of Information intends to broadcast all audio and video content at the highest quality. The Ministry of Information is currently upgrading infrastructure to be able to meet highest possible broadcast quality. The objective of this project is to support transport of all broadcast traffic without comprising quality.

The goals of the project is to complement the existing system(s) and install new systems to provide the operations staff with flexible management systems and interfaces to effectively control the network.

The chosen solution will become critical entities in the operational network infrastructure of MOInfo. Therefore, it shall provide a significantly high level of system stability, service availability, scalability, proven reliability and significant performance measurements, to ensure high quality of provided services.

With that, the proposed systems shall provide well defined and user friendly management interfaces in order to provide MOInfo the option to dynamically and independently define and integrate with new network components.

The offered solution shall in general comply with the latest relevant telecommunication standards.

MOInfo is committed to deployment of systems based on open and standard interfaces, as such, compliance to relevant standards shall be sought where applicable.

1.4. Anticipated Project Time Frame

The range of services covered by this project is diverse and continuous. The Bidder shall offer a 3 year warranty on hardware and software with onsite operations support for the duration of the warranty period.

Bidders are requested to suggest the appropriate time necessary to implement their proposed solution and project execution shall not exceed 30 Months from the date of signing the contract.

The Contractor shall submit with his offer a time-related 'GANT' chart indicating the different activities for all project activities during the project execution period. Active Equipment should be delivered and installed within 5 months of signing the contract.

Following the successful commissioning of the network, a 60-day period shall be given for testing the entire Network before issuing the Preliminary Handing Over Certificate (PHOC).

The contractor shall submit after signing the contract his designated team staff with relevant experience that will be responsible for operating the entire network.

The warrantee period shall start from the date of issuing the PHOC, for a period of 36 months NOT INCLUNDING the faults & shutdown time whether it's an entire OR partial network failure , the failure time will postpone the issuing Final Hand Over Certificate (FHOC) by the same amount of time.

This project shall be executed and handed-over to MOInfo under the full responsibility of the Contractor.

1.5. Bidder Response

The Bidder is required to submit their proposal and costs by due dates. The proposal shall contain solution information and pricing details of their products and services for each of the requested solutions, that will meet or exceed MOInfo's requirements as described in this document.

The Bidder must clearly indicate the compliance of his solution to the specifications as described in this document.

Terminology applied shall be uniform throughout the documentations, and shall follow ITU, ETSI, 3GPP and IETF recommendations on terminology where applicable.

Statement of Compliance must be submitted using the following coding convention:

- N = Not compliant
- P = Partially Compliant
- C = Fully Compliant
- F = Future Compliance (supported by Roadmap)

The Bidder is required to provide necessary description to support his compliancy level and include it in the "Comments" column as shown below or provide clear references to documentation included:

Clause	Description	N	P	C	F	Comments / Clarifications	Reference to documents for details

Failure to agree to or comply to any of these terms and conditions and/or not following the required outline and/or not providing required information as softcopy and/or proposing payments not linked to deliverables may result in the proposal being disqualified from the evaluation.

The Technical and Financial Proposals Shall be submitted in separate and sealed envelopes. Each should be clearly marked as “Technical Proposal” and “Financial Proposal”.

The format of technical response to this RFP is expected in separately marked sections and as follows for Technical Proposal:

- Section 1 - Executive Summary
- Section 2 – Compliance sheets (in the format mentioned above) supplied in Excel and PDF formats.
- Section 3 – Solution Description (including project, implementation, support plans, references etc.)
- Section 4 – Bidder’s files and supporting documents
- Section 5 – Bidder’s Annexes
- Section 6 – Proposal Softcopy on a Compact Discs. Compliance sheets must be submitted in Microsoft Excel and PDF formats.
- Section 7 – References: Bidders are required to provide references with details eg. Systems supplied, services deployed, architecture deployed etc.

If the requested information is available within the submitted documentation, the bidder shall clearly refer to the section and relevant documents in the comments section of the RFP.

Failure to agree to or comply with any of these terms and conditions and/or not following the required outline and/or not providing required information as softcopy and/or proposing payments not linked to deliverables may result in the proposal being disqualified from the evaluation.

1.6. Questions relating to the RFP

Bidders who have questions regarding this Request for Proposal are requested to direct them in writing to the Central Tenders Committee using CTC guidelines for such communication.

Only the specified department named above is authorized to communicate with Bidders during the evaluation process. Bidders shall not ask for or accept instructions, directions and/or advice from any other person, unless specifically authorized by the above-mentioned Party.

1.7. Submission of Proposals

All proposals should be submitted to the Central Tenders Committee.

1.8. Selection Process & Evaluation Criteria

The Ministry of Information in Kuwait selects on the best value/price performance and on best meeting the ministry’s requirements.

The overall bid proposal will be qualified according to its responsiveness according to following criteria:

- Functionality – addressing stated requirements and Goals
- Technology – Standards based Open Architecture
- Deployment schedule – Aggressive Project Delivery Plan
- Cost
- Commercial Conditions

1.9. Bidder Presentation

A Bidder may be asked by the MOInfo to make a presentation and/or arrange a meeting to clarify any portion of his response and/or to further explain how the MOInfo's requirements will be met.

1.10. Offer Validity

The Bidder's offer shall remain valid for a period of 90 days from submission and should be extendable for an additional 90 days without variation.

1.11. Main tasks and Responsibilities

The Bidder's responsibilities within this project are derived from the leading concept of full responsibility for setting fully operational systems on a turnkey basis. This includes:

- Supply of H/W platform and S/W licenses: Define the relevant infrastructure configuration and relevant communication interfaces. With that supply S/W license with 3rd parties licenses where relevant.
- Provide modular pricing quotation: Quote for system modules. Provide pricing breakdown offer, where core modules are priced and optional features and sub-systems are prices separately
- Design documents: Construct system detailed design document, and include detailed documentation. Final version will be agreed with MoC engineers later in the process.
- Implementation plan: Offer detailed implementation time tables (MS Project based), with specifying task responsibilities and recourses, key milestones. The implementation plan should clearly show all dependencies between individual modules for every part of the project. Project plans for individual solutions may be prepared and presented separately.
- System installation: Install the system at MOInfo premises, after defining and ensuring preparation of environment conditions and power (Bidder's responsibility).
- Setup of relevant operational parameters, according to MOInfo operational requirements.
- Integration and processes: Perform full integration of all systems supplied
- Performance. Arrange performance benchmarks, measuring system load and check system limits, to ensure optimal on-going performance and future operational rate scalability

- Recovery procedures. Define and test system shutdown and up time after system crash, including data recovery and setup.
- Documentation: Provide Installation guide, User guide, and system operator guide for daily maintenance and operations and other relevant technical documentation.
- Training: Include sufficient and customized training sessions for system operators so that MOInfo will be able to be self-sufficient.
- Onsite Assistance: Provide onsite assistance for the duration of the warranty period
- Warranty. Provide 3 year warranty with Onsite support, counted from first day of full functioning system operation after MOinfo's written approval that the System passed all Acceptance Tests.

The design, workmanship, material and finish of all equipment shall be of the highest quality and should be built for long service. The equipment shall be based on the latest technological developments and incorporate the best features available.

1.12. Maintenance and Support

1.12.1. General Requirements

The detailed provisions regarding Warranty, Maintenance and Support are those appearing in the Agreement. For the purpose of highlighting only, following are the main principles regarding the provision of such services, which apply to the submission of the proposal:

- The Bidder will include three years of Warranty for all hardware and software supplied with onsite support for the System and all the components supplied under this RFP. The warranty shall start only after a signed Acceptance Test Protocol (ATP).
- During the Warranty Period, the selected Bidder shall be responsible to fix any problem or fault in the System, in accordance with the terms specified in the Agreement and ensure that the network provides 99.999% availability.
- The Bidder will provide full access to its Bidder resources such as web documentation and technical literature, as shall be required for the provision of warranty and maintenance services.
- During the Warranty period and the Maintenance and Support periods, The Bidder shall provide spare parts and upgrades and updates, as required.
- The Contractor shall undertake, as part of the contract to make available to MOI all necessary spares whenever needed for 10 years after Project Acceptance. Any spare part/s ordered post the warranty period should be delivered without delay to insure continuity of the service. Otherwise, MOI shall have the right to purchase it/them from other source/s, charging all extra costs to the Contractor plus 10% administrative expenses.
- The Contractor shall guarantee all sub-systems of the project, for a period of 36 months after the date of issuing the PHOC. All defective units, devices or components during this period shall be replaced by the Contractor, free of any charge to MOI. If during the guarantee period epidemic faults take place in such

a way that affects the performance, reliability or availability of any of the project sub-systems, the Contractor shall bear full responsibility to remedy and rectify these problems in a good engineering practice free of any charge to MOInfo.

- The assigned staff CV shall be submitted and approved by MOI to ensure assigned staff is sufficiently qualified
- The warranty period shall include all hardware and software updates to ensure uninterrupted operation of services.
- Provisions must be made for emergency support services outside normal working hours and on holidays.
- The contractor staff shall be equipped with their own vehicle and communication means dedicated to support the project.
- The onsite support staff shall engage with the assigned MOInfo staff taking an "On the job" training approach towards MOInfor assigned support engineers.
- The bidder's engineer shall submit a monthly report of readings taken, maintenance work, and faults occurred and the preventive maintenance established to return the system to service, the inventory of the spare parts available, the status of the optical fiber cable periodical test, etc.
- The contractor engineer shall setup reports and workflow for the work orders, maintenance support, operational and spares material assets management.
- The ministry reserves the right to request a change of the assigned Engineer or Technician, in case he is found unsuitable. In case the contractor wants to change any of his staff, the arrangement shall be after getting MOI approval.
- The bidder shall cover on his offer his staff (Engineers and Technicians) salaries, accommodations, transportations, allowances, insurances, and telecommunications, etc

1.12.2. System Acceptance

The Bidder is responsible for the Equipment installation of the system, so that the system stays globally functional. Therefore, equipment commissioning must be done through demonstration of product capability and compliance with requirements when wired and configured in the system.

The entire system, subsystems and all devices shall be inspected and tested in the factory, MOInfo staff shall attend the factory inspection ,The period of the factory inspection shall not be less than Eight working days. Test data sheets shall be revised and verified during commissioning at MOInfo sites.

The Bidder shall present system and power supply redundancies by unplugging redundant links.

The Bidder shall be required to perform a range of Site Acceptance Tests (SAT) on site for each individual sub-system to demonstrate that all items have been correctly installed and adjusted on a location by location basis and that the sub-system operates in every respect in accordance with the Specifications.

During this phase the equipment are powered and the automation and networking are gradually integrated layer by layer.

The tests shall be performed by the Bidder and witnessed by the MOInfo's Representative.

Any defects, which may become apparent during the course of these tests, shall be immediately rectified by the Bidder at his expense.

The Site Acceptance Test Specifications shall be prepared by the Bidder and submitted for Approval.

All Site Acceptance Tests shall be carried out in the presence of the Bidder's Representative who shall sign off the testing documentation on satisfactory completion of the tests.

The Site Acceptance Test Specifications, at every level, shall be subjected to configuration management and change control by the Bidder.

If modification or reprogramming is required as a result of the tests, all affected parts of the Site Acceptance Tests, as determined by the MOInfo's Representative, shall be re-tested.

The results of the Site Acceptance Tests, version of software and hardware tested, together with any re-testing as a result of failure, shall be recorded and signed by the authorized personnel of the Bidder and the MoC's Representative.

After successful test(s) of individual systems, Bidder and MOInfo will sign Acceptance Test Protocol (ATP).

1.13. Training

The Bidder is required to conduct end-user training at MOInfo premises, customized specifically to the MOInfo's particular requirements, configuration and maintenance of the installed equipment and components.

The bidder shall price and provide training course (6 weeks locally + 6 weeks abroad) for 8 MOInfo staff participants.

The contractor shall supply training manuals & handouts, The contractor shall propose a detailed agenda of the training, saying all the topics to cover. MOI will review this agenda and could request for modification before the beginning of the training.

The local training shall focus on the theory concepts of all parts of optical network (fibre, testing fibre, troubleshooting, maintenance techniques, NMS system all its subsystems... etc). The trainees shall be evaluated for knowledge transferred at the end of the training period.

The instructors shall be professional trainers with at least 5 years' experience in networks to cover all parts of the proposed network.

Offsite training in bidder's training centers abroad shall be available only to MOInfo staff that adequately qualifies during evaluation.

The training shall focus on practical practices on (testing fibre, troubleshooting, maintenance techniques, NMS system all its subsystems operation & control… etc). The courses shall be followed by formal evaluation of trainees attending the sessions.

The bidder shall submit in his offer detailed local and external training program for the proposed system.

In the offer the bidder should consider for the offered equipment in the system factory/factories (FAT) inspection and testing. The bidder shall make the logistics arrangements with the factory and MOInfo will arrange the cost for the travel, accommodation, and local transports for its staffs. The FAT shall be carried out by MOI engineers. Test sheet shall be provided by contractor and shall be approved by MOI engineers before testing.

For each product and/or application, the Bidder shall provide a detailed description of the training offered.

Training shall be in sufficient scope to ensure that all trainees who complete the program will be certified as capable to administrate, operate and/or maintain the equipment, systems, and facilities provided and installed, and to ensure a smooth transition between implementation and operations activities.

Training shall be conducted in English.

Training manuals, including course outline, basic text of instructions modules, and trainee workbook, films, slides, video tape(s), charts, models, hand-outs, catalogues, samples and other visual, written aids to complement instruction.

However, practical "hands-on" familiarization shall be provided on equipment that is either installed and operable or ready to be installed and capable of being operated. Test and development environment may be used to support "hands-on" familiarization.

Operators shall be provided with a thorough training in all aspects of system/sub-system operation under both normal and abnormal conditions. This training shall include, but not be limited to:

- Orientation to provide overview of system/sub-system purpose, configuration, and operations,
- Terminology,
- Operations theory and interfaces,
- Equipment appearance, layout, functions, concepts and operations,
- Operating modes, practice, and procedures under normal and emergency conditions,
- Safety precautions,
- Use of tools and test equipment,
- Use of system utilities, diagnostic software and various software tools associated with the system maintenance,
- Preventive maintenance,
- Troubleshooting, diagnostics, and testing,
- Backup and restoration of software/configuration,

- Assembly and disassembly,
- Repair and parts replacement,
- Parts ordering practices and storage,
- Failure and recovery procedures,
- System/sub-system cabling,
- Familiarization with and use of manuals and other reference materials.

Administrator course shall include but not be limited to:

- Orientation to provide overview of system/sub-system purpose, configuration, and operations,
- Terminology,
- Operations theory and interfaces,
- Software design and organization,
- Database structure, generation, and modification,
- Assembly, compilation, linking, editing, debugging, distributing, testing and integration of program modules,
- Interface software design,
- Configuration management and control of software,
- Backup and restoration of software,
- Use of system utilities, diagnostic software and various software tools associated with the design, development, and maintenance of the System,
- Familiarization with and use of manuals and other reference materials.

1.14. Miscellaneous

1.14.1. Quality Assurance

The Bidder shall put place in adequate controls to ensure quality assurance of the whole project.

1.14.2. Bidder Qualifications

The Bidder along with partners, if any, should be companies specializing in providing the systems listed in this RFP each with a record of successful implementations. The bidder or his suppliers must provide evidence of similar projects experiences within the GCC countries.

The Bidder shall list all partnerships and alliances related to the RFP response, distribution, or development of products or services, including the purpose for and duration of the collaboration.

The offered solutions / systems shall be, as often as possible, a standard off-the-shelf package utilizing the latest hardware and software technology. Any major system development effort necessary to meet specified requirements is unacceptable. Even if this system is a new concept, it should not require huge development and shall be based on existing and proven technologies and standards.

1.14.3. Reference list

The Bidder should provide reference list of 2 references for every solution proposed as a response to requested products / solutions in this RFP. The bidder (or their partners) must submit in his proposal a list of all relevant Project Experience in optical fiber networks within the GCC countries.

References given must be verifiable and shall be from recognized communication or broadcast networks (not IT), covering voice and data services.

1.14.4. Contact point

The Bidder should specify contact person for all pre-order negotiations and for project management. Another person shall be appointed as a point of contact for implementation and as also escalation point for emergencies.

1.14.5. Company general information

The Bidder shall specify:

- The size of the company, financial result, number of subject matter experts. In case the bidder represents a group of Bidders, the same shall be provided for individual companies that for supply relevant parts of the solution.
- Certificates by an internationally recognized body such as ISO 9001, Q90, etc. shall be included where available.
- Where relevant, the bidder shall provide information on methodologies that company follows for projects and relevant aspects of business.
- Person authorized to contractually bind the organization for any proposal against this RFP.
- Brief history, including year established and number of years the company has been offering the proposed solution and services.

1.15. Scope of Work

The Ministry of Information seeks to procure state of the art, future proof technology to interconnect all MOI sites to the Master Control Room. Bidders are encouraged to present the best solution fibre network topology and interconnection between all sites achieving the highest efficiency of design and operational ease and with redundancy.

The network shall connect MOInfo Complex with all sites stated in Appendix A , the bidder's offer must contain documents explaining the proposed network design & technical solution.

The bidder shall design, supply, install, train, operate and guarantee and maintain the whole network for a period of 3 years.

Any existing fibre cables already present on the premesis shall not be reused. All fiber layed for the network shall be a completely new installation.

The bidder shall propose a redundant network Fibre Optics Transmission Systems with no single point of failure. The proposed equipment shall be configured to provide self-healing and highest level of redundancy.

The bidder shall propose Encoders & Decoders Codec's systems) for:

1. all Forward & Reverse Broadcast Channels
2. the transport and distribution of all the Radio and TV channels, using the fiber network to provide a unified Codec's system.

The bidder shall allocate at least 10Gbps Ethernet data link between MOI building complex and Stations in addition to bandwidth calculated for transport of broadcast traffic traversing through the network.

The bidder shall propose Broadcast Content Monitoring System for all traffic passing on the Fibre Network.

The bidder shall propose NMS for all the subsystems equipment in the network to manage the equipment in the network.

The bidder shall propose a Unified Network Management System to manage and control all subsystems and element managers to present a unified view of the network.

The bidder shall propose a Disaster Recovery System such that all MOI Broadcast services will survive with reduced and minimal impact on the services and revert to backup systems in case of a major incident in the primary systems.

The bidder shall supply DC and AC Power System with minimum 8 hours battery backup system.

The bidder shall conduct a survey for fibre routes and document all routes and required civil works.

The bidder shall be responsible for preparation of site and all associated requirements such as shelters, power, air-conditioning etc. in locations where there is no room for equipment at MOInfo premises.

The bidder shall supply and install all necessary accessories needed i.e. distribution board, equipment racks, power cables, coaxial cables, distribution frames blocks, DC Power System, etc.

After contract signing the contractor must submit detailed survey drawings, original plus 5 copies for the whole network routes showing all details (cable routes and indoor layout of equipment ...etc).

The bidder shall supply 10 copies of operation and maintenance manuals .

The bidder must prepare and submit this proposal according to the following structure:

1. The bidder must submit a technical proposal with detailed description and the network designs..

2. The bidder must submit in his proposal detailed design block diagrams showing the all the network components and interconnection to MOInfo facilities.
3. The bidder must provide complete data sheet for all equipment.
4. The bidder must submit in his proposal a detailed itemized Bill of Quantities.
5. The bidder must submit in his proposal full local and factory training schedules & plans .
6. The bidder must include all required Test Tools in his proposal.
7. The bidder must submit in his proposal point to point fiber cable inside the sites in APPENDIX A he last table which have two or three locations single mode 48 core Two Tx + Two Rx Modules two shelf's with redundant power supply each one core carry one video HD/SD with Two audio channel and patch in the ring room to can feed signal to MOI building complex.
8. The network must include facility to transmit ten (10) ASI signal from MOInfo Complex to any of the broadcast station listed in Appendix A .
9. In addition to the regular video and audio channels transmitted to the stations dual 1GBPS Ethernet connectivity (with multicasting /1GMP) between all radio and TV transmitting stations & shuwaikh -center radio links with MOI building complex.
10. The bidder must put a dedicated redundant fiber link between Moinfo building complex to shuwaikh-center radio links for radio engineering department to enable fiber channel (8GFC- FULL DUPLEX 1600 MBPS) connectivity.

1.16. Insurance

The Contractor shall insure the materials and works in the joint name of the Contractor and the Ministry of Information to full value of them against any loss or damage from whatever cause arising other than the standard "executed". The said insurance shall be effected in such a manner that both parties are covered during the period from the date of acceptance of the offer until the project will have been taken over by the issue of the "Provisional Handing Over Certificate (PHOC)".

1.17. As-Built Drawings, Manuals, and Catalogue

Before testing and commissioning of the system, the Contractor shall submit soft and hard sets of the following:

a. Routes of ducts & buried cables with full details.
b. As-Built Drawings, schematics, wiring, etc. of all units.
c. Detailed description of equipment.
d. Operation/Instruction/Service manual/s.
e. Part List Catalogue (where applicable).
f. Complete Test Data Sheets of all the used equipments.

1.18. Compliance

The bidder shall be considered in full agreement with the contents of this Tender Document (Arabic Text, All Chapters, and Annexes). In case the Bidder has any reservation, disagreement or deviation - whatsoever - from this document, he should clearly indicate so by filling separate tables (Non-Compliance Schedules) originated by

him and divided in columns for: Chapter No., Page No., Item No., and Reasons of Non-Compliance. Any offer doesn't contain a compliance statement will be rejected.

1.19. Selection, Rejection, Addition and/or Modification

The MOI reserves the right to:

a. Select the most preferred Manufacturer to MOI in case the Bidder offers more than one manufacturer for the same type of product for any item, which must be in conformity with the Tender Document's specifications and requirements.
b. Reject/cancel any auxiliary items (or quantities) in the offer within 10% maximum of the total value of the offered price of the project. Deductions for the said items shall be accomplished according to the contract rates, It is confirmed that cancelled items - if any - shall not affect the overall performance of this turn-key-system.
c. Add any auxiliary item/s (or quantities) similar to those in the offer within 10% max. of the total value of the offered price for the project. Payments for the said items shall be accomplished according to the contractual rates.

1.13 Preliminary/Provisional Handing Over Certificate (PHOC)

The PHOC will be issued 60 days after the PHO Test Completion date. In case of abnormal defects, PHO shall be delayed until restoring the equipment to the normal acceptable state.

1.20. Final Handing Over Certificate (FHOC)

The FHOC will be issued 36 months after the date of the PHOC. FHOC shall be delayed until restoring the system to the normal acceptable state.

1.21. Environmental Conditions

a. Temperature
   - Max. Ambient sun radiation temperature: 80*C
   - Max. Ambient shade temperature: 50*C
   - Min. temperature can be below freezing point on some nights.
b. Humidity
   - Max. Humidity:98.5%
c. Rain
   - Max. Annual Rainfall: 130 mm
   - Max. Rainfall in one day: 35 mm
d. Dust

The sites are characterized by severe sand storms. Therefore, special attention shall be given to the high dust contents in the outside atmosphere, and special precautions to prevent ingress of dust for the indoor installations for the transmission from the vehicle.

2. Optical Fibre Cable Plant

2.1. The bidder shall include in his bid the quantities of the following :

- Direct Buried Route X km (bidder responsible to survey distance)
- Duct Route X km (bidder responsible to survey a distance)
- Concrete Encase 2 Way Duct Bank X km (bidder responsible to survey a distance)

2.2. After contract signing the contractor shall finalize his survey and submit report showing final length (distance).

- If actual length after finalizing is more than the survey distance it is contractor responsibility to compensate for the required distance at his own cost, if the finalized distance is less than the extra cable length, the remaining fiber will be handed over to MOInfo stores.
- Excavations must be completed using the most appropriate means and in relation to environmental characteristics, the soil stratigraphy and in accordance with Ministry of Communications guidelines for installation of fiber optic cables
- The depth of the trench must be kept as constant as possible in order to avoid abrupt changes in slope.
- In places where there are no ducts, the contractor shall install ducts in co-operations and co-ordination with the Ministry of Communications and various government agencies to ensure compliance with relevant MOC standards
- In places where ducts are available for use, the contractor must secure appropriate approvals and reservation of ducts from the Ministry of Communications and other relevant government agencies
- All installation work must be carried out according to Ministry of Communications guidelines and procedures for installation of fiber optic cables
- Buried Cable shall be dual armoured cables as specified in this document
- As built drawings shall be submitted to the MOI, showing all detected underground utilities of other governmental associations. It is contractor responsibility to make excavation of 1 meter depth trench, lying of the buried cable, backfilling, and compaction of the soil after backfilling then cleaning the route after laying the cable must be done by the contractor just after the completion of the burying of the cable.
- Splicing shall be performed by using fully automatic splicing machine operating for single-mode O.F.C.
- The maximum allowable attenuation of a single splice is 0.03dB.
- Inside MOI building complex and all Transmitting Stations indoor optical fiber cable shall be offered Armoured / Fire Resistant Optical Fiber Cable Shall be offered which shall protect the optical fiber cable from fire and vertical pressure.
- All civil works for laying fiber cable, inner-duct or duct to be implemented shall be approved by MOC.

3. Optical fiber cable specifications

This specification covers the design requirements and performance standards for the supply of optical fibre cables as described below. The features described in this document are intended to provide information on the performance of the optical cable and aid in handling and installation. SINGLE MODE FIBRES SPECIFICATIONS (Accordance with ITU Rec. G.652.D) ,

The following specifications are for single mode fibres Loose Tube optical fibre cable for both duct and direct buried cable:

3.1. Fiber Optic Cable Specifications

Each Vendor in their proposal will recommend the specifications which best meets the requirements for this project. However at a minimum the cable RFP response should meet the following criteria listed below. The fiber cable specifications shall at all times meet Ministry of Communications requirements for optical fiber. In cases where specifications in this document deviate from Ministry of Communications specifications, the Ministry of Communications specifications shall be applied.

Bidders are expected to have full knowledge of the Ministry of Communications fiber optic network cable and deployment specifications and regulations.

a. All Dielectric (AD) ribbon and loose-tube fiber optic cable, in 48- count sheaths
b. Conforms to international standards ITU-T G652D
c. Composed of all Dielectric (AD) materials
d. Made of a dry, gel free cable design
e. Incorporates dry, water blocking elements
f. Specific Reel Lengths will be provided at contract award, based upon manufacturer's recommendations.

3.1.1. Cable Description

Dry-Core Loose Tube Optical Cables with 48 optical fibers. The color coded fibers shall be housed in color coded plastic buffer tubes which are stranded around a dielectric central strength member. Dry water blocking tapes , wrapped around the core, provide protection against water ingress. The cable sheath shall be composed of a polyethylene jacket with corrugated armour Tape layer for rodent protection and additional Polyethylene jacket. Highly visible ripcords shall be placed under each jacket layer for quick sheath entry.

3.1.2. Quality

To meet ISO 9000 standards.

3.1.3. Reliability

Both initial and periodic qualification testing shall be performed to assure the cable's performance and durability in the field environment.

To meet industry standards organizations such as Bell Communications Research (Bellcore), Telecommunications Industry Association (TIA), Insulated Cable Engineers Association (ICEA), International Telecommunications Union (ITU), International Electrotechnical Commission (IEC), American Society for Testing and Materials (ASTM), Rural Utilities Service (RUS), and The Institute of Electrical and Electronics Engineers (IEEE).

3.2. Cable Design

3.2.1. General

Dry-Core Loose Tube Optical Cables shall utilize Reverse Oscillating Lay (ROL) of the buffer tubes within a dry water blocked core to allow the cable quick and clean cable entry in either end or mid-span access. The cable style shall come in two different sheath constructions designed for various outside plant applications and installation techniques.

3.2.2. Dual Jacket-Armoured

For areas where fiber cable is direct buried, the cable shall be Dual Jacket-Armored Sheath Loose Tube cable including a corrugated steel armor layer between two Polyethylene jackets. This cable construction shall provide the necessary rodent protection and added compressive strength required for direct buried applications.

Fiber colour code:

FIBER No.	COLOR
01	Red
02	Blue
03	White
04	Green
05	Yellow
06	Grey
07	Brown
08	Black
09	Orange
10	Violet
11	Pink
12	Turquoise

3.2.3. Markings

The entire length of each cable shall be marked with the following items:

- Manufacturer name
- Year of Manufacture
- Part No.
- Fibre Count
- Sequential Length Markings in Meters

All length markings are placed at one meter intervals. The actual cable length will be within ±3% of the marked length. All markings are in indented in permanent white characters.

Reel Markings

The text on the reels is to be printed as follows:

- Manufacturer Logo

- Word mark
- Cable Type
- Single-Mode X Fiber Count
- Marking Showing Side to Unreel Cable

All reels will contain a securely fastened metal plate with the following information:

- Order Number
- Drum Number
- Reel Gross Weight (kg)
- Reel Net Weight (kg)
- Reel Cable Length (Meters).

3.3. Type Testing

The proposed cable should conform to following type tests

Type Test	Test Method
a. Bend Test	IEC 60794-1-2 method E11, EN 187000 method 513.
b. Repeated Bend Test	IEC 60794-1-2 method E6, EN 187000 method 507.
c. Tensile Test	IEC 60794-1-2 method E1, EN 187000 method 501.
d. Impact Test	IEC 60794-1-2 method E4, EN 187000 method 505
e. Crush Test	IEC 60794-1-2 method E3, EN 187000 method 504
f. Water Penetration Test	IEC 60794-1-2 method F5, EN 187000 test method 605 A
g. Torsion Test	IEC 60794-1-2 method E7, EN 187000 method 508
h. Temperature Test	IEC 60794-1-2 method F1, EN 187000 method 601

3.3.1. Mechanical Characteristics

Shall comply with G.652.D fiber specifications

3.3.2. Testing & Inspection

The optical properties of all fibers shall be measured prior to cable manufacturing with bi-directional OTDR and remain traceable through-out the manufacturing process and the lifetime of the cable. After cabling, 100% of all fibers in each length of cable shall be measured at all operating wavelengths. The attenuation for each fiber shall be recorded. Cable testing shall be compliant also to the requirements in Chapter ?11 on TESTING.

4. Transmission Equipment

4.1. Overview & Introduction

The bidder shall propose new IP based core network connecting all MoInfo sites listed in the RFP tender through MPLS (Multi-Protocol Label Switching) technology. All main sites will be directly connected through the main core fiber ring through 10GE interfaces configured on the core routers with the specifications detailed below.

Remote sites shall and small stations will be connected to the nearest core node through access router which provides access connectivity to different end systems through Giga Ethernet and E1 interfaces and use 10 GE port as uplink to the nearest core node router. The following requirements features, and specifications shall be met this items.

The bidder shall propose a full IP based network and equipment with MPLS capabilities to obtain a dual fully protected dual ring self-fiber optic transmission system for all Forward and Reverse Radio & TV services in addition to all supporting services.

The bidder shall propose a minimum of 100GE level multi-function core routers in main sites which can provide high-speed, large capacity information transmission, and is adaptive to the requirement of backbone networks, local networks and Metropolitan Area Networks now and in the future.

The bidder shall propose and supply a single IP network building and a new network, deploying fiber to carry all forward and reverse Radio and TV traffic between MOI building complex dual stream MCCTV and MCCR and MOI Stations and sites two separate systems (streams).

The IP nodes located in all MoInfo main sites shall act as core and/or edge nodes in the MPLS network with fully redundant configuration in route switch processor modules, 10 Gig Ethernet line cards and power supplies.

Access routers shall be located in main and remote sites for adding different equipment to the ring using different types (E1, 1GE, 10GE) interfaces

The bidder shall transport and distribute all the Radio and TV traffic with a protection structure of the optical transmission network.

The bidder shall propose and supply single unified NMS application building of the project to manage the network components.

The Network NMS shall become part of the Centralized Unified Umbrella Management System UMS

The bidder shall supply optical power budget calculation showing the operation of the optical equipment over each span of optical segment in each direction whenever needed.

Type of 10 GE optical transceivers shall support distance at least 40 km between one main site and the next one in the fibre network.

The bidder shall propose new backbone network with minimum of 10GE equipment that is in dual direction self-healing topology. IP routing protocols shall automatically recalculate the route path to reach certain destination in case of any fibre cut. The resulting network shall form a unified backbone using packet switching.

All the newly proposed equipment must be fully managed and controlled from NMS application capable to fully manage all the project for supporting POTP and all supplied equipment in the network carrying the TV traffic between, MCCTV, and all nodes in the network.

For the Live Events Sites, the bidder shall propose IP access device dropping E1s and Giga Ethernet interfaces connected to the nearest node on the fibre network which hosts an edge router

4.2. Core Routers Specifications

One core router shall be proposed for every MoInfo main site. The core router will be used for connecting the main sites through 10 GE fibre network ring. All specifications listed below are mandatory.

The proposed core routers shall be flexible and upgradeable and based on a modular design with minimum of 10 slots for future scalability. The upgradability of the nodes means that they should be upgraded without affecting traffic.

Core node must be based on a Terabit platform.

Equipment must support at least 15T of backplane capacity to guarantee future scalability and support for high capacity line speed ports.

The equipment Switching Capacity shall support not less than 7 Tbps and the Forwarding Performance shall support not less than 1600 Mpps to guarantee high capacity links with line-speed and future proof scalability.

The device shall have separate switching card slots, which is completely separated with the main control boards, to ensure that does not affect the forwarding while single master board is failing over. Redundancy in switching fabric is required.

The proposed equipment shall have dedicated Traffic Management chip (not integrated with other Network Processor chips) in order to avoid low lookup bandwidth and poor QoS performance that affects Ministry of Information main business of video and audio.

The equipment shall be upgradable to 400G/slot smoothly to guarantee support of high-throughput line-speed future interfaces or high-density modules with line-speed ports to satisfy the increased demand for bandwidth for at least next ten years.

The line cards should support flexible cards, mixing of different type sub-card to insert, to have the flexibility to use a service slot with different traffic types to maximize slot usability.

The line cards should support hot-swap of mother-cards and daughter-cards which does not need configuration for easy troubleshooting and maintenance (O&M) in case of a port failure with minimum influence to the traffic on other ports.

Must be configured with two redundant route switch processor modules.

Route switch processor must have out of band management ports.

Must be configured with redundant hot swappable AC power supplies.

Must be configured with two redundant modular transport line cards each with minimum of 100 Gbps backplane performance

Must support two 100 Gigabit Ethernet interfaces ports module

Must support layer-2 tunneling protocols

Must support more than 128K MAC addresses.

Must include where required variety of interfaces including 1-gigabit Ethernet interface, 10-gigabit Ethernet interfaces, STM1 and OC192/STM64 interfaces.

The Core node shall satisfy the service requirements of IP or MPLS bearer networks and backbone networks by providing support for a wide range of features and powerful service processing capabilities.

The equipment shall support VPN services - L2/L3VPN and MVPN shall be all deployed depending on networking requirements.

Shall providing reliable protection at different levels, including the equipment level, network level, and service level.

The Core node shall cope with various kinds of bearer network failures and ensure service recovery.

The Core node shall support easy evolution from IPv4 to IPv6.

Equipment must support a hot-swappable fan system , if a fan fail the equipment must be operate normally.

Equipment must support 1588V2, SyncE, Adaptive clock synchronization.

Equipment must support at least 4096 VLANs per Interface.

Equipment must support IEEE 802.1ad VLAN Stacking.

Equipment must support node or link switchover in less than 50ms at L3

Equipment must support BGP / MPLS VPNs for IPV4 and IPv6.

Shall support a variety of reliability technologies, with device-level reliability greater than 99.999%, an end-to-end network failure within 50ms-200ms recovery, and most comprehensive BFD, with full-service protection switching.

The network availability is critical for Ministry of Information business, the proposed equipment shall support various reliability techniques mentioned which can achieve 50ms fault convergence to safeguard the normal operation of the Ministry of Information business.

As Ministry of Information traffic is mainly video and audio, the QoS performance is a very important performance parameter of the router and the following characteristics are the minimum mandatory features to guarantee high quality traffic handling for our business.

Must have full MPLS features including:

- Label Distribution Protocol (LDP)

- Targeted LDP (T-LDP)
- Resource Reservation Protocol (RSVP)
- Differentiated Services (DiffServ)-aware traffic engineering
- MPLS L3VPN (including Carrier Supporting Carrier [CSC])
- IPv6 Provider Edge and IPv6 VPN to Provider Edge
- MPLS Traffic Engineering (including TE-FRR)
- MPLS TE Preferred Path
- Support VLL, VPLS, and support Martini & Kompella MPLS L2VPN
- Equipment must support the signaling and control versions of VPLS specified in RFC 4762
- Equipment must support L2 Interworking over MPLS; the equipment should be able to interconnect different L2 protocols through a circuit PWE3
- Equipment must support L3 VLAN interfaces that can be associated to one or more VLANs or VPLS
- Support HOVPN

Provide industry authority EANTC IP / MPLS interoperability test reports, certificate that the interoperability with the high-end routers of mainstream manufacturers

Must have full routing features including:

- IPv4 Routing (BGP, Intermediate System-to-Intermediate System [IS-IS], and Open Shortest Path First [OSPF])
- Support MD5 of RIPv2, OSPF, IS-IS, and BGP, support multi-process OSPF and IS-IS.
- Equipment must support routing protocols IPv6 OSPFv3, RIPng, IS-IS, MP-BGP
- Support BGP peers not less than 4K
- Equipment must support traffic engineering between different OSPF areas
- Route Policy Language (RPL)
- Hot Standby Router Protocol (HSRP)
- Virtual Router Redundancy Protocol (VRRP)
- IPv6 routing
- BGP Prefix Independent Convergence (PIC)

Must support IPv6 including:

- Support various technologies for transition from IPv4 to IPv6: manual tunnel configurations, automatic tunnel configurations, IPv6-to-IPv4 (6-to-4) tunneling, Generic Routing Encapsulation (GRE) tunneling, and Intra-Site Automatic Tunnel Addressing Protocol (ISATAP) tunneling.
- Support IPv4 over IPv6 tunneling and IPv6 Provider Edge Router (6PE).
- Support NAT44 and DS-lite.
- Shall support IPv6 Multicast, IPv6 Access, IP FRR for IPv6, RSVP IPv6, and LDP IPv6.

Must have full wide area network technologies and protocols including:

- Packet Over SONET
- Packet Over Synchronous Digital Hierarchy (SDH)

- Non-Ethernet interface support up to OC768/STM256
- Frame Relay
- Point-to-Point Protocol (PPP)
- High-Level Data Link Control (HDLC),
- Frame Relay Fragmentation.16 (FRF.16) Multilink Frame Relay (MLFR)
- Multilink Point-to-Point Protocol (MLPPP)
- Link Fragment Interleaving, FRF.12
- Any Transport over MPLS (AToM)
- Internet Protocol header Compression (IPHC)
- Link Noise Monitoring (LNM)
- System granularity scales down to nxDS0

Must have minimum of the following Quality of Service features:

- More than 3 million queues per system
- Class-Based Weighted Fair Queuing (CBWFQ)
- Weighted Random Early Detection (WRED)
- Priority Queuing with propagation
- 2-rate 3-color (2R3C) Policing
- Modular QoS CLI (MQC)
- 5-level H-QoS so that the traffic can be managed properly and the network resources can be used rationally.
- Support MPLS HQoS
- Support DS-TE 8 CT
- In-Service Modification
- Support VOQ (Virtual Output Queue)
- Support low forwarding delay of less than 30μs
- Support VoQ Buffer of 100ms

Must support the following added services:

- Support IPSec, IPSec tunnels; switching capacity>=10G
- Support video enhancement: RET/FCC

Must have the following multicast features:

- Source-based and shared distribution trees
- Protocol Independent Multicast sparse mode (PIM-SX)
- PIM Source Specific Multicast (PIM SSM)
- Automatic route processing (AutoRP)
- Multiprotocol BGP (MBGP)
- Multicast Virtual Private Network (MVPN)
- and Multicast Source Discovery Protocol (MSDP)
- Internet Group Management Protocol Versions 2 and 3 (IGMPv2 and v3):
- IGMPv2 and v3 snooping

The proposed equipment shall have possibility to use one or more interfaces of 100 Gbps, 40 Gbps, 10 Gbps, 1 Gbps, FE, STM-256, STM-64, STM-16, STM-4, STM-1, E1 interfaces

All the required protection must be 1+1.

4.3. Access Routers

All listed specifications are mandatory.

- Shall be based on distributed forwarding architecture so that the performance can be guaranteed and avoid large number of broadcast packets that waste bandwidth and avoid delay and jitter in the network which is crucial to ensure the quality of audio and video communications.
- The Switching Capacity shall be at least 100Gbps and the Forwarding Capacity shall be at least 75Mpps to guarantee high capacity links with line-speed and future proof and avoid packet loss or delay or degrading normal functioning of Ministry of Information services.
- The equipment shall support redundant Main Control Units in order to improve the reliability of equipment.
- For configuration flexibility, the platform must allow configuration rollback capabilities.
- The line cards should support hot-swap of mother-cards and daughter-cards which does not need configuration for easy troubleshooting and maintenance (O&M) in case of a port failure with minimum influence to the traffic on other ports. Faulty boards shall be replaced while equiopment is online without interrupting services and node operation.
- The equipment shall be capable of transporting both circuit based TDM traffic as well as packet based data traffic over the IP core network. It shall be capable of grooming traffic from Ethernet, and TDM through access routers and uploading all traffic over IP on the uplink port to core node.
- Shall support high density 10GE WAN Interfaces.
- Must provide minimum of two 10G ports plus 1G ports
- Must provide legacy interfaces (E1, STM-1, etc) where required
- Shall support LDP FRR and VLL FRR. LDP FRR can protect MPLS tunnels established by LDP; VLL FRR can protect VLL L2VPN. The convergence time can be less than 50ms; the traditional route convergence will take several seconds.
- Shall support hardware high-performance BFD and less than 5ms BFD interval to guarantee fast network failure detection to improve network stability and reliability
- Network management system should be able to manage all the types of equipment and associated systems specified in this bidding document.

4.4. Applied Standards

The proposed network must be compatible with ETSI and ANSI, i. e. supporting IP-MPLS , MPLS-TP or SONET architectures, and the latest mapping structure recommended by ITU-T shall be adopted.

4.5. Service Interfaces

- The proposed equipment shall have the ability to process multiple lines of ECCs, fully satisfying the requirements for complex networking, supporting complex IP network topologies, such as linear, ring, hinge, ring with chain, tangent ring and crossing ring, at levels of STM-1/STM-4/STM-16/STM-64/1GE/10GE/100GE.
- The core network speed shall be configured with 10GE speed from day one and core nodes shall be ready to raise the network speed to 40 GE without replacing any of the installed modules and only adding 40 GE port modules to them.
- The Proposed core equipment shall offer versatile service interfaces: STM-256/STM-64/STM-16/STM-4/STM-1 optical interfaces; STM-1, E1 (support framing processing) electrical interfaces, GE Ethernet interfaces. Multiple bearer modes like EOS, embedded ERP and embedded MPLS-TP are available to deliver Ethernet private line (EPL), Ethernet virtual private line (EVPL), and Ethernet private LAN (EPLAN) and Ethernet virtual private LAN (EVPLAN) services, VPLS, addressing requirements for multiple technologies in different networking environments.
- The proposed core equipment must provide a wide range of service interfaces, which include: STM-256, STM-64, STM-16, STM-4 and STM-1 optical interfaces, STM-1; as well as 1 GE, 10GE, 40GE and 100GE Ethernet interfaces. In addition, it can provide highly integrated service interface board, meeting the needs of large capacity service access. For the types of service interfaces, please refer to the following table:

Type of Service Interface
STM-256 optical interface
STM-64 optical interface
STM-16 optical interface
STM-4 optical interface
STM-1 optical interface
100 GE interface
10 GE interface
1 GE interface

The proposed MPLS equipment shall adopt a modular architecture. The selection of different boards will make equipment with different functions.

The various units shall have boards of the following different types:

1. Redundant route switch processors with active/active switch fabric.
2. SPA Interface Processor for connecting service Port Adaptors with the required interfaces
3. Ethernet cards for high speed Ethernet interfaces
4. Redundant power supplies

The proposed equipment shall provide mixed insertion of boards, easing service configuration and network planning & optimization. System operation shall adopt front-facing interfaces, easier for maintenance.

The proposed equipment shall employ pluggable optical modules (SFP module, LC connector) It shall support online optical power detection for all optical interfaces, facilitating rapid location of line failure boosting efficiency.

The core equipment should support color interface for 10G to transport IP signal directly to WDM systems.

4.6. Multi-Service Support

The proposed equipment shall be feature robust processing capability for data services, support the- topology operation, support unicast, multicast and broadcast services, implement bandwidth statistic multiplexing to increase bandwidth utilization, feature rapid service provisioning, service priority access control and total network fairness mechanism and guarantee high QoS.

The proposed equipment shall provide mixed insertion of boards, leaving it easy for service configuration, maintenance and network planning and optimization.

The proposed equipment shall support EPL, EPLAN, EVPL and EVPLAN complying with ITU-T G.ethsrv. The system must support point to point service, multi-point to point service and multi-point to multi-point service.

The system must provide IP MPLS and core system expansions to MPLS-TP encapsulation protocol.

Each Ethernet module shall support Ethernet JUMBO frame with 9216 Bytes size.

The bidder shall specify maximum number of VLAN per port.

The equipment shall support Ethernet Point to point service, with more than one user sharing the same VC-TRUNK: EVPL complying with ITU-T G.ethsrv.

The equipment shall support of Ethernet multi-point to multi-point service, with more than one user sharing the same VC-TRUNK: EVPLAN complying with ITU-T G.ethsrv

Each Ethernet board shall support manual and dynamic MAC address configuration function and MAC addresses (source & destination MAC address) filtering function.

The bidder shall state if IGMP snooping is required.

For layer 2 services, hub and spoke features should be supported. Hub port can communicate with hub or spoke ports, and spoke port can only communicate with hub port.

The core equipment should support RRPP with switching time less than 50ms for fast convergence failover.

The proposed equipment shall support QoS CoS marking and Classification based on:

1. Port
2. 802.1QVLAN
3. CoS IEEE 802.1p (Customer Edge-VLAN CoS)
4. DiffServ (IP Precedence/ DSCP)
5. Virtual Output Queuing (Unicast)
6. Virtual Output Queuing (Multicast)

Policing and Shaping Per flow policing (CIR/PIR)Dual Token bucket (CBS, PBS)

Queuing functions based on:

1. Tail Drop
2. Random Early Detect (RED)
3. Weighted RED

Scheduling functions based on:

1. Round Robin or Weighted fair Queuing (WFQ)
2. Strict priority (SP)
3. Mix of SP and WFQ

The system should support H-QoS (Hierarchical QoS) or H-VPLS (Hierarchical VPLS)

The system must support IEEE 802.1ag for detection, verification and isolation of connectivity failures.

The system must support IEEE 802.3ah for Ethernet in the first mile to allow data communications to the Ethernet CPE.

Netflow or NetStream performance management shall be supported

4.7. Equipment and Network Protection

The proposed network equipment hardware shall adopt redundanct design and system architecture.

The proposed equipment shall provide advanced equipment-level protection: with redundant design in hardware, dual-switch fabric architecture which run in active/active mode

Multiple protection modes shall include cabinet external power supply protection, board power supply protection and sub-rack power access protection.

The proposed equipment shall provide network-level protection: enabling ITU-T-recommended networking characteristics, protection modes containing: 1+1 link multiplex section protection, link 1:N protection, unidirectional path protection ring in addition to automative reroute calculation once main route is interrupted

The proposed equipment shall feature robust intelligence, support automatic discovery of network topology and resource, automatic and rapid end-to-end service provision and resistance to multi-node failure in the network.

The proposed equipment shall provide a combination of protection and restoration which greatly improves network survivability; shall provide plug and play network node to allow operators to implement network architecture optimization and operation & maintenance with ease; support differentiated classes of services support traffic engineering, balance network loads and improve resource utilization.

The proposed MPLS core routers shall be able to implement all the network protection modes specified by ITU-T, to meet the different networking requirements of customers

The equipment should be able to support full IP MPLS based protection. 1+1 and 1:1 should be supported.

The equipment should support Link Aggregation (LAG) on all Giga Ethernet, 10 GE, 40GE and 100 GE interfaces.

4.8. Optical Adaptability

The optical power shall be solved for the transmission of 10Gbit/s. The Proposed equipment shall adopt advanced dispersion management and out-of-band FEC technology, which effectively enhances the signal-to-noise ratio of signals, and improves error code characteristic within a certain distance, thus enhancing the adaptability of the system to the optical fiber and guaranteeing the adaptation of the system.

5. Network Management System

This specification refers to the operational and technical requirements for a Unified Management System to Manage, Monitoring and Control all the whole network and devices.

The offered Management system must conform to high availability standards and must have redundancy build in throughout the entire solution to ensure the functionality is globally available with no single point of failure.

The Management system shall be installed at primary and backup locations at MOI Center and has to be seen as an integral part of the MOI Network Systems being developed to obtain a Unified Fiber Network and Applications Service related to the MOI project.

The Network Management system shall provide real-time and historical views of network performance and availability statistics. It shall provide detailed monitoring and analysis of all network infrastructure including, SDH, Codecs, Routers, Switches, UPS, Servers and any other SNMP-enabled devices resulting in a dashboard view of how the network is performing. The Network management system shall provide:

1. Status monitoring and Performance monitoring
2. Parameter setting
3. System control

4. Logging and statistics.

The primary objective of the Management System is to provide continuous monitoring of all the Communication & Broadcast Systems and related technical equipment at MOI. The Management System shall be able to show hazardous situations affecting several systems at the same time and shall reduce the time to bring the situation back to normal condition.

The Management System shall be located in a room connected to both MOI Main and DRS Center and remote sites allowing for a unified operations and support environment. The Operations Center shall house the Network Management servers and workstation of the Network Management System and other technical systems and sub-systems of the project.

The Management System shall be integrated with all subsystems and use SNMP for integration of devices to offer a single unified view of the entire network and individual components.

The Management System shall be unified to integrate and manage the following:

- Network Transmission System
- Codecs Management System
- Cable Management System
- Asset Management System
- Content Monitoring System
- Disaster Recovery System
- Power System
- Other sub-systems without NMS via device SNMP for management and monitoring.

The Network Management System shall be installed in the Communication Management Centre of the MOI and shall comprise at least:

- A Secure LAN, on which all dedicated UMS systems of the various operational systems are connected;
- A processing system and storage medium to perform the monitoring and control functions;
- A communication unit with interfaces for the monitoring and control of systems not equipped with a dedicated Management system;
- At least 4 workstation with large high-definition colour flat screens;
- A disc subsystem for logging;
- One hard-copy Network printer
- Appropriate access control to protect access to systems by unauthorized personnel

The proposed Network management System must:

- Use the browser/server (B/S) architecture to provide network management anytime and anywhere

- Manage a minimum of 50 devices by default
- Allow for Device management
- Allow users to customize manufacturer information
- Allow users to customize device types
- Allow users to customize alarms
- Allow users to customize performance counters
- Allow users to customize commands for backing up device configuration files
- Allow users to create a topology view for devices from multiple manufacturers and query and filter alarms on these devices

Must be able to manage Topology as follows:

- Automatically discover network devices and recognizes topology links between the devices, and provide physical topology views
- Automatically discover LLDP Layer 2 links and Side-By-Side Layer 3 links
- Display managed Network Elements (NEs) and their connection status in topology views, including the display of subviews, NEs, links, and NE status
- Allow users to browse topology views to know the network operating status
- Display topology views by layer based on subviews and store NE location information based on user Information
- Allow users to customize topology background and icons
- Display key information about NEs and links as tooltips

Must be able to manage alarms as follows:

- Allow users to view alarms on the alarm panel, in topology views, or on the alarm query page to monitor alarms in real time
- Display total alarms on the alarm panel in real time.
- Display alarms of different severities in different colors
- Allow users to customize alarm search criteria and sort alarms.
- Allow users to export alarm information, acknowledge and clear alarms, and access the NE management page or device panel from the alarm browsing page
- Notify maintenance personnel of alarms remotely by email or SMS messages in a timely manner

Must be able to manage Performance as follows:

- Collect performance data periodically and supports 4-level performance thresholds
- Provide threshold alarm management and generate threshold alarms based on a specific threshold in a monitoring instance
- Provide a variety of predefined one-click reports
- Allow users to select counters to be displayed in reports and display reports in various modes such as pie charts, bar charts, and line charts
- Generate scheduled reports, print reports, or save reports as files.
- Generate report files in Excel, Word, or PowerPoint format and send reports by email

Must be able to manage BGP/MPLS VPN as follows:

- Provide L3VPN service management
- Manage VPN services for third-party devices
- Automatically discover deployed VPN services without knowing device roles
- Support two discovery policies: discovery by VRF routing policy and discovery by VRF name
- Allow users to view service configurations to monitor services
- Monitor service topology
- Monitor service performance
- Monitor service quality
- Support PE-PE or PE-CE link diagnosis by network segment
- Support VRF, LSP, and ICMP diagnosis by network layer
- Allows users to view VPN routing information
- Provide VPN service reports

Must be able to manage SLA as follows:

- Provide SLA management
- Support multiple test instances
- Provide quick diagnosis
- Provide SLA service management
- Score service quality comprehensively
- Provide SLA task management
- Provide SLA report management

5.1. Hardware

The Network Management System shall be based entirely on COTS components delivered by state of art, industry-standard, server.

The Network Management System shall consist of the following components:

1. Redundant Main Server
2. Power Supply
3. Interfaces
4. Rack Assembly
5. System Consoles

The technical requirements for the hardware of the main Server shall be according the latest specification available on the market at time of tendering. All supplied equipment shall confirm to industry standards and must be rack mountable. The servers must be at least:

- Industrial Servers
- 64Bit 1,8MHz AMD Opteron 2000 with 4MByte ext. Cache or equivalent
- 1024MB RAM (4x256MB)
- 146Gbyte int. SAS Hard Disk Drive
- 8 GB 4mm DAT int. Tape Drive (incl. 3 Tapes)

- 20.1" LCD Flat Panel Monitor for Service Purposes
- Mouse or Trackball
- Enhanced Keyboard
- User licence Solaris 10 or later
- Interfaces: Twisted pair- and MII Ethernet 100Mbit/s (MII>AUI-adapter X467A opt.), serial, parallel
- 3.5" Floppy Disk
- DVD with 10Gbyte storage capacity minimum for long-term storage
- Required printers

5.1.1. Power Supply

Bidders are responsible to provide all required power for Network Management system utilizing power from power systems supplied as response to global power requirements for all supplied systems.

5.1.2. Console Furniture

For Administrator and Supervisor position, all keyboards, computer system units, etc., shall be supplied as standard furniture.

The CONTRACTOR shall include a proposed drawing, with the tender, showing a typical console design and layout, together with photographs of consoles installed during previous projects and specifications concerning the materials and furniture the bidder intends to use.

Final design of the console shall be subject to final design submittal procedures.

The standard of console and furniture proposed by the bidder shall be equal or better than "Knoll, Hannah Desk System" range for consoles and two piece ergonomically adjustable range of chairs (Concorde, High Back Multi-Tilter, regular width, standard seat depth, 2410-16) for 24/7 operation.

Operator controls shall be available on the front panel for power on-off, brightness, contrast. All other controls shall be located behind the front panel and shall be accessible for maintenance purposes only. Accommodation for the printer must also be included.

5.1.3. Reports

Availability (Graphs and Tabular Summary) reports shall be made available by the following breakdown:

- Daily
- Weekly
- Monthly
- Quarterly
- Yearly

6. Disaster Recovery System (DRS)

MOI is requesting all bidders to propose a full Forward and Reverse Broadcast Channels continuity Disaster Recovery System (DRS).

The configuration made on the main site should be periodically and automatically synched to the backup site (i.e. once a day)

Any setup of new releases/ fix should be installed both on main and backup site

The bidder should list all the external and not quoted requirements and resources needed to synch the main and the backup site (i.e. a connection of 10 Mbit/s, a 40 ms latency, etc.)

The DRS shall be a redundant network platform that delivers the broadcast service to the MOI Stations in the event of a catastrophic incident involving the primary digital Head Ends.

The solution shall provide rapid recovery of digital broadcast video.

The DRS shall provide continuity of all Broadcast Radio and TV Channels to the MOI Transmitters in case the Primary Radio and TV Heads Ends at the MOI Center is down.

The DRS shall be housed in a secondary location at MOI building complex.

The DRS must include a Complete Radio Broadcast Head End and a TV Broadcast Head End Full Duplicates to duplicate the Primary Radio Head End and TV Head End requested in this tender.

The Network Operations & Management Room shall be connected to the Main and the DRS Centers.

The DRS must include a Complete Fiber Optic Transmission Nodes for each of the two Secondary Heads.

The DRS must Transmit and Receive all the Forward and Reverse Radio and TV Traffic.

The DRS shall house a Backup Network Management System Servers and Operators Stations connected to all Sub-systems. The DRS Network Management shall be a replica of the Primary Network Management and shall provide the full means to execute system monitoring and management of all sub-systems.

The DRS shall be connected to all Element Management Center Housing all the sub-systems NMS Servers and Operator Stations.

The DRS shall be acting in Standby Mode (non-Active) and will become Auto-Active upon sensing the Primary Head Ends or one of the Head Ends is down.

The DRS shall Automatic re-routing and backup of all traffic.

The DRS shall perform Redundancy analysis with components failure simulation, backup facilities and others.

The DRS shall provide Full Redundancy and connected to the MOI Backbone Fiber Optic Ring Network. In the event of failure of the primary connection the backup connection shall take over without any detectable delay. The operation shall not be affected. Even in case of Transmission Node failure the Network shall be automatically connected to a backup Node that takes over the whole traffic without any further reconfiguration.

Traffic transfer shall be available to the backup-control center and between MOI Broadcast Stations and Remote Live locations. The Broadcast Stations shall not detect that a fault in the Center Head has occurred and shall continue operation with minimum service interruption. The Decoders at the Broadcast Station shall be agnostic to fault at the center and shall not require reconfiguration or re-patching of cables.

Transmitter and receiver systems shall be linked redundantly to their related monitoring and control systems at the MOI Primary Management and DRS Management Systems.

The DRS shall be equipped with Same Traffic and Transmission Capacities as the Primary Systems.

The DRS shall provide the means to execute system monitoring and control.

The DRS shall include all the Backup hardware and software required to act as a replica system. It must be possible to backup all the data of the management station without shutting the Network Management software down. This is to ensure the continuous monitoring of the network during backup time.

The DRS Solution shall features

- Straightforward synchronization of Codecs system
- Straightforward synchronization of Transmission system
- Redundant monitoring computer support
- Reliable, scheduled automatic database backup
- Rapid fault detection/notification
- Comprehensive failover management
- Easy to navigate graphical user interface
- Regional Network Control architecture support

The Disaster Recovery Application shall help to ensure reliable delivery of services between MOInfo building complex and Stations in the event of most incidents involving the primary digital Head End – either through natural disaster or human error.

The DRS shall protect against but not limited to the following factors that can impact MOInfo ability to deliver its services:

- Software failure
- Hardware failure
- Power interruptions
- Malicious acts
- Facilities damage (water, fire, smoke)

The Disaster Recovery solution shall help minimize the impact of these and other events. The solution shall provide a live, up-to-date backup Digital Network Control System for rapid failover in the event of a primary network failure.

The Disaster Recovery solution shall use redundant, external Monitoring Computers to collect the primary Network and Codecs metrics and updates and synchronize critical data to the standby Systems.

Both Primary and Secondary radio and TV Head Ends shall be are online and functioning in a redundant Head End topology, but only the primary Head Ends assumes the broadcast, or active, role. In this scenario, the equipment in the broadcasting site is active and performing accordingly. Systems at the DRS site are inactive and in a standby mode, ready to assume active status should a switchover occur.

The DRS shall as a key role perform health checks on systems at both Primary and Backup Head Ends, so that if a switchover must be performed, it can be done with minimal network impact, and reduce downtime. To accomplish this task, the DRS solution shall synchronize the necessary data between the active and inactive systems to ensure the appropriate data is on both systems in the event of a failover or switchover.

The DRS shall have also provide the following functions:

1. Schedule backups or run an immediate Backup Now
2. Archive multiple sets of the network file system, database and key files
3. Backup the Application Server file system
4. Navigate the easy-to-use web interface
5. Email notification of backup status
6. Use fast Links to backup directly to disk
7. Manage backups with greater accuracy and precision
8. Protect the system with remotely stored and created backups
9. Reduce the manpower required to manage backups and simplify system restores
10. Reduce costly, cumbersome tapes and tape storage
11. Help minimize system and services outage time

The bidder shall include all necessary Hardware and Software as well as Design, Installation, Testing, Warranty and Maintenance required to implement the DRS functionalities.

7. Codec's System (Encoding System or Head End)

7.1. General Requirement

The following specifies the minimum CODECS system the bidder must comply with.

The bidder must propose new latest technology Codec's system and NMS. All the equipment must be supplied from a well-known US or European Manufacturer Company specialized in the Video and Audio systems complying with international DVB standard and support HD and all IP architecture. The encoding and decoding systems must be deployed in different device rooms of the MOI center.

The Radio & TV Broadcast Codec's shall be centralized each in its Head End forming a stream interfaced and integrated into the MOI upgraded Fiber Optic Transmission network equipment to transport all the Forward and Reverse TV & Radio Broadcast Channels.

All the Forward TV & Radio Broadcast Channels from MOI building complex MCCTV and MCCR shall be separately and carried as dual stream per Head End made available simultaneously at all the MOI Transmitter stations for drop and inserts of the required services.

All the Reverse TV Broadcast Channels from remote sites must be multiplexed at the MOI in new nodes and carried as an single stream per Head End made available simultaneously at the MOI MCCTV for drop and inserts of the required services for interface back into the system.

The bidder must propose Radio & TV Codec's for the MOI Center & Remotes to interface to the Hybrid MSTP Transmission Network. The proposed codec's system shall allow transporting all contents at SD-SDI/HD-SDI baseband speeds and using all IP architecture with GE IP outgoing port that connects to Hybrid MSTP network for transmitting signal.

The bidder must propose Codec's flexible to support a variety of MOI formats and interfaces such as Video PAL B, and SDI for SD &HD and Audio balanced analog & AES/EBU Digital Audio, SDI with embedded and not embedded audio.
The bidder shall propose front conversion section allowing the Codec's system to deal with the various input formats available at MOI.

The bidder shall offer Codec's or the following Forward & Reverse Radio & TV Channels. Each station shall be supplied with its own Codec's system Radio station for Radio program and TV station (for TV program all reversed program in both only in 14 floor in complex through MOI Center Head Ends to be located at MCCTV or MCCR). The codec's system scope includes the locations and services listed in the following tables:

For all TV services, each video channel is associated with 2 audio.

The SD and HD video signals shall be allowed to be transported at SDI baseband speed or selectively encoded according to MOI requirement.

The Audio bit rate shall be defined by the user. Each Audio shall be encoded at a minimum rate of 384 kbps.

All TV and Radio channels shall be simultaneously transmitted to each node and shall be accessible at each station based on all IP architecture.

The proposed system to be directly upgradeable allowing additional channels to the system by adding more hardware boxes which are managed from the Codec's Management system.

All forward channels codec's only must be configured with 1:1 redundancy featuring auto-switch over between the main and backup per channel codec's. This protection scheme shall be implemented for the codec's at the Head Ends located in Main center, the codec's located at the backup center, and the codec's located at MOI remote station.

The protection scheme shall allow the remote MOI station to switch over to protection equipment upon detection of fault in the operational head ends.

The codec's located at head end system located at the Main MOI Center shall be duplicated at the Disaster Recovery (DRS) Center. Both Centers shall be able to independently handle the entire MOI operation such that the DRS is able to replace the Main Center in case of Disaster.

The 1:1 Redundancy of the Codec's and Auto-switch over shall be totally from the Main Center (the DRS will not be used to backup per channel wise protection) which is in operation and normally unless the total operation has shifted to the DRS in case of disaster.

All the Radio and TV channels shall be available at all and each MOI stationon the SDH Network Node.

Each Transmitting station shall be able to decode all the channels individually and simultaneously.

All Reverse traffic shall be connected at the MOI Stations Nodes and terminated at MCCTV SDH Node. Each Reverse site shall be supplied with encoding system. The reverse decoders shall be configured with the programs number. The Selection of incoming program shall be from the Codec's NMS or Front Panel.

The bidder shall supply a single Codec's NMS to monitor and control the Codec's network, quickly identify problems, control devices and analyze network performance. The NMS must fully manage all the supplied encoders, decoders, and any additional future hardware added to the Codec's. The Codec's NMs shall be integrated with the UMS. The system should also be able to select real time streams to be broadcasted.

The Codes shall take power from the AC backup UPS fed from MOI mains.

The codec's shall support HD and SD signals and support all HD signals input without replacing any devices.

7.2. Codec's Specification

The bidder shall as a minimum propose Encoders with the following minimum specifications:

- The codec's must support both BNC and Ethernet ports for IP
- Up to 4 Video stream / 1RU.
- Video ports can be electrical or optical.
- All features can be activated by SW licenses key not hardware replacement.
- Transport of video, embedded audio and VB.
- Best in class connectivity and redundancy features featuring Live-Live support for 1Gbps
- Allows adaptation to evolution of transport protocols through software downloads.
- The codec's must be low form factor a compact 1 RU chassis.

- The codec's must be configured with four Codec cards, with each card having one port for balancing the capacity and reliability.
- The codec's cards must be individually configured with either electrical video interfaces or optical video interfaces, or a combination of both.
- The encoders must be equipped with redundant ports
- The codec must be configured in a hot 1:1 configuration to support maximum uptime with minimum switchover interruption.

For operator at remote site and direct connect, the codec must be controlled via an easy and intuitive GUI from standard Internet Explorer. The GUI must allow program provisioning through drag-and-drop functionality.

The interface must provide detailed information to the user, showing the codec configuration, input and output bit rate monitoring, video stream alarms, and other information.

For easy access to details, sorting of video service information can be performed on various criteria, including input and output ports, bit rates, and video service names.
The bidder must propose an integrated network monitoring and control Network Management and Control (NMC) system to be integrated with the upper level Network Management System. All functionality available via the HTML interface must be available from the centralized NMS.
The codec's must have flexible video signal monitoring

Each Codec card must be equipped with dual Ethernet ports capable of either 1 GbE or 10 GbEwhich is software selectable. The codec's must feature Unicast and multicast, 802.3, Ethernet, RTP, UDP, IP, ARP, ICMP, IGMPv2 / v3, VLAN, Quality of Service: Diffserv/TOS 802.1p.

The codec's must be able to work on SD 625i25, 525i29.97 and HD 720p50, 720p59.94, 1080i25, 1080i29.97.

The codec's must support 3G HD Video – 1080p50, 1080p60.

The codec's must support Adaptive clock recovery – no need for external reference.

The codec's must feature Redundancy as 1:1 Redundant configuration, 1:1 GbE/10GbE port backup, Dual Streaming mode (IP Port mirroring), and Video input ports can act as backup inputs for each other.

The codec's should support IP, SDI or Digital Audio as source for video and audio encoding. Forward Error Correction (FEC) is required as it can avoid data loss (related to network configuration and errors).

Availability of MPEG-2 TS over UDP, redundant 100/1000 BaseT outputs is mandatory.

IP input specifications:

1. 2 x Ethernet (100/1000 Base T) for redundancy
2. Network protocols: UDP mode (MPEG/UDP/IP) or RTP mode (MPEG/RTP/UDP/IP)

3. Streaming modes: Multicast or Unicast.

SDI input Compliant with SMPTE 259M(SD-SDI) & SMPTE 292M(HD-SDI).

Digital Audio input Compliant with ITU-R BS.647-2 / AES 3-2003.

The video encoding format is required to be MPEG-4 AVC/H.264 Main and High profiles.

The codecs must be capable of generating the DVB tables (DVB Compliant).

Video encoding specifications:

1. Codec: MPEG-4 AVC/H264 Main Profile @L3 for SD channel
2. MPEG-4 AVC/H264High Profiles @ L4 for HD channel
3. Aspect ratios: 4:3, 16:9
4. Bit rate modes: VBR, CBR.

A low resolution/low bitrates extra video stream is required for PIP delivery to the STB. The bidder will detail the capabilities of the proposed encoders in that sense, including image resolutions and bitrates for this additional, simultaneous stream. Indicate encoders capability to supply both normal and reduced streams simultaneously and affection to their overall process capability.
Audio encoding specifications:

1. Codec: MPEG-1 Layer II, AAC / HE-AAC v1 / HE-AAC v2, Dolby® Digital(AC3), Dolby® Digital pass through
2. Channel modes: Stereo, Mono channels
3. Audio bitrates (in stereo channel mode):
4. MPEG-1 Layer II: 56 to 384 kbps
5. Dolby® Digital (AC3): 56 to 448 kbps
6. AAC: 32 to 384 kbps
7. HE-AAC v2: 32 to 128 kbps
8. Sampling rate of 32 KHz, 44.1 KHz and 48 KHz.
9. The video has to be synchronized with the audio.

User friendly GUI for remote management (SNMP and web browser) with the capability to configure different parameters, the management system must be used to manage the redundancy and supervision of the encoders. A web-based application, with open API is preferred.

Proposed source selection/architecture should be done based on cost-effectiveness. The possibility of easily include in the proposed architecture both high-quality and more cost-effective encoding solutions (for premium / standard channels) will be positively valued.

The bidder will provide recommendations for output bitrates settings that can ensure a quality as close as possible to the source contents. These recommendations will be addressed to H.264, for both SD and HD resolutions.

The codec'sshould be controlled by Network Management System. However, if necessary, they can be configured and monitored as well via web GUI and front panel also

Allcodec's equipment must operate on 220V AC.

The codec's system must support redundancy with manual or automatic recovery with 99.999% availability.

The codec's system must support the entirerequirement in items 32.19& 32.20& 32. 22& 32. 23in the scope of work .

7.3. Encoder

1. The Encoders shall be standalone, and shall be of high-performance and supports statistical multiplex systems.
2. The Encoders shall be configured into a Head End for the Centers and shall be interfaced with the SDH Transmission Ring Fiber Optical network.
3. At each location the proposed Encoders shall be configured with protection as stated above and managed from the Codecs NMS.
4. The proposed Encoder shall be suitable to transport compress or uncompressed SD & HD complying with DVB and MPEG standards to encode signals using latest efficient compression technology.
5. The Encoder shall feature in low-delay connections
6. The Encoder shall allow embedded audio.
7. The Encoder must support multiple audio formats, providing excellent flexibility. It supports up to two stereo pairs of either MPEG-1 Layer II audio or Dolby Digital (AC-3) 2.0 audio with a broad range of bit rates, and supports pass-through of externally encoded Dolby 5.1 audio or DOLBY-E audio. If a system requires multiple radio programs together with video services, it also supports encoding of separate radio programs simultaneously with audio belonging to the locally encoded video service.
8. The Encoder to provide efficient management, the encoder must support SNMP or CORBA protocol for the Network Centre NMS Management System and other Integration with the overall third party UMS control system applications. The Management System shall support Encoder with conditional access.
9. Encoder needs to support, MGP (Multicast Guard Protection)
10. Encoder needs to support 8/10 Bit transmission

7.4. Decoder

1. At each location the proposed Decoders shall be configured with protection as stated above and managed from the Codecs NMS ,The Decoders shall be for broadcast video audio contribution of professional quality SD & HD digital television signals
2. The Decoders shall be standalone for video channel, and shall be of high-performance and supports statistical multiplex systems.
3. The proposed Decoder shall be Modular designed to receive broadcasts complying with DVB &MPEG standards, supporting the decoding of SD/HD signals using latest state of art of technology.
4. The Decoder shall have modular inputs and outputs, and can be configured to suit the specific needs of the required application.

5. The Decoder shall provide IP input port, support SD-SDI and HD –SDI output.(havingASI and supporting IP for input and output interface).
6. The Decoder shall use the independent decoding hosts design, with 1RU chassis, support docking with the third-party encoder.
7. The Decoder shall be modular in design, extensible support decoding 2 SD/HD signals by one decoder.

7.5. IP Multiplexer

The bidder shall propose an IP Multiplexer providing a simple and efficient method of transmitting multiple transport streams. The IP multiplexer shall have the following specifications:

1. Aggregate and distribute direction IP packet.
2. GE physical interface support.
3. Supports VLAN and QinQ.
4. Can be configured for VLAN or QinQ.
5. High-performance management: Neighbor discovery, Traffic classification based on the combination of the L2 protocol header, IP quintuple, outgoing interface, and 802.1p field.
6. Extensive fault monitoring: Link monitoring, Fault notification and Remote loopback
7. Centralized management of logs, alarms, and debugging information, Electronic label, User operation logs, detailed debugging information for diagnosing network faults, Network test tools such as traceroute and ping commands, Interface mirroring and flow mirroring.
8. Power, fault, and status LED indicators.
9. Remote control via Ethernet providing all configuration, monitor, and control functions.
10. Supports IGMPv1, IGMPv2, IGMPv3 snooping.
11. Supports PQ, WRR, DRR, PQ+WRR, and PQ+DRR scheduling.
12. User configuration sets that can store and recall commonly used parameters sets.
13. Auto-ranging, auto-sensing power supply.
14. Compact chassis construction.

A remote unit shall be easily connected with either in band or out band Ethernet port allowing the NMS to configure, monitor, and control.

8. Power Equipment

8.1. General Requirement

The bidder shall propose DC and AC power supply equipment with 4 hours backup batteries minimum.

The bidder shall submit DC and AC power budget showing sufficiency of supply and backup time for each station. The bidder shall show sufficiency when operating from the power supply, when operating from the battery backup, when batteries are drained and

the power system has to supply the equipment and charge the batteries at the same time.

8.1.1. DC Power General Requirement

DC power systems shall be complete with all rectifiers, power distribution planes, circuit breakers, low-voltage disconnect panels, ground bus, metering, alarms, and batteries. And the system should have the ability to configure 50A rectifiers and have the capacity of 200A (4 rectifier) so as to meet the expansion requirement.

All rectifiers shall be redundant, and configured for load sharing.

The rectifiers shall provide DC power for powering the station equipment and for charging the station battery.

All DC power systems shall be nominal -48 VDC. If other voltages or polarity are required, they shall be supplied by DC-to-DC converters operating from the main -48 VDC power system If DC- to-DC converters are required, they shall be redundant and load sharing.

8.1.2. DC System Design

The design of DC power systems shall be based on the following criteria:

All of the rectifiers in each system shall be identical in manufacturer, model, and ampere output capacity.

The number of rectifiers in a power system shall be determined by the total load, the output capacity of the tendered rectifier, equipment and the redundancy configuration. All systems shall utilize a minimum of two rectifiers.

The output capacity of the rectifiers shall be sufficient to simultaneously power the station equipment and to recharge the station battery.

In a 2 - rectifier redundancy configuration, anyone of the two rectifiers shall be rated for the full initial load plus a reserve of at least 50% current capacity.

Rectifiers shall operate in the load sharing mode, and load sharing shall be balanced within 10% of the appropriate load share during normal operation.

Rectifiers shall be modular for easy replacement. It shall be convenient to increase the rectifier capacity of the power system by adding modular units

A minimum of 8 hours of reserve battery time shall be provided for all sites, based on the initial load plus an additional 50% future load.

8.1.3. Rectifier Design

The power systems shall include redundant rectifiers for high reliability. The rectifiers shall provide the following design features:

Rectifiers shall be switch mode high - efficiency type.

The RMS voltage rating of the rectifier stack shall be sufficient to withstand, without damage, the full output of the transformer secondary when the load is disconnected from the D.C. terminals (i.e. under open circuit conditions)

The switching components shall be protected against high voltage surges with MOV surge suppressors

Systems shall use a front - access modular rectifier concept with multiple parallel rectifiers for high reliability

Rectifiers shall be easily replaceable using plug - in construction where possible. It shall be possible to remove any rectifier from service and install a replacement rectifier safely and easily, and without switching off the power system.

Rectifiers shall include individual metering of voltage and load current for each unit, either by means of metering on each unit, or by common metering and a multi-position selector switch.

Each rectifier shall have input and output circuit breakers.

Rectifiers shall be equipped with current output limiting at nominal 105% load, automatic shutdown on over-voltage, and thermal protection shutdown with automatic reset at safe temperature.

8.1.4. Rectifier performance

Rectifier shall meet the following performance specifications:

Input A.C power shall be nominal (240 VAC + 20%, 50 Hz. +l0%).

Output DC voltage shall be adjustable over the range from - 44 to -56 VDC (positive ground).

Rectifier efficiency shall be at least 96% at the conditions of 240 VAC input voltage over the load range from 50% to 95% of rated load.

Rectifier power factor shall be at least 95% over the load range from 50% to 100% of rated load.

Output voltage regulation shall be within + 0,5% from no - load to full - load at nominal AC line voltage.

Rectifiers shall be battery eliminator design with built-in filtering. Filtering shall provide output electrical noise less than 26 dBrnc measured with a resistive load, and less than 250 mV p-p measured from DC to 100 MHZ.

Rectifiers shall withstand an input surge of up to 1000 volts with 0,05nano seconds rise time and 50 micro seconds pulse width.

Cooling shall be by natural convection.

Rectifier MTBF shall be at least 500,000 hours.

Rectifiers shall be listed and approved by a recognized international organization such as US Underwriters laboratory or VDE.

The operating temperature range of the rectifier should be -40? to 75? and at 55?, the rectifier should be able to run with full load. Equipment must not be damaged irreversibly when the operation is made outside indoor normal condition. The bidder should provide info related to power consumption of each equipment.

Rectifiers should operate in parallel and distribute loads proportionally. The unbalance of load sharing should be less than ±3% of the rated output current. When an abnormity occurs to one rectifier unit, system should work normally.

Rectifier module should have the soft-start function, soft start time (the time of DC output voltage from starting up to climbing to the nominal value) can be determined by user requirements, usually 3s~8s.

8.1.5. Rectifier indicator

Rectifiers or rectifier shelves shall provide indications, alarms, and test points for the following conditions:

- AC input power on indicator
- DC output power on indicator.
- DC output current limit indicator and alarm.
- High DC voltage shutdown indicator and alarm.
- Rectifier fail indicator and alarm.
- Front panel test points for connection of a precision digital DC voltmeter.

8.1.6. Power distribution panel

The power system shall include a DC distribution panel with the necessary circuit breakers, ground bars, metering, and control circuitry.

Fuses shall not be used for circuit protection. The distribution panel shall provide the following features:

The panel enclosure shall be metal, and shall have a hinged door for front access to the internal cabling.

All circuit breakers shall be protected against accidental tripping by personnel working near the equipment. Breakers shall be recessed or behind a protective cover so that a deliberate action must be taken to switch a breaker off.

It shall be possible to add circuit breakers to the panel safely and easily, and without switching off the station load

The power distribution panel shall have mounting spaces for at least 25% greater than the number of initially installed breakers

All breakers shall be clearly labeled with the type of load, and with the rating of the breaker

All redundant equipment shall be supplied by two separate circuit breakers

All DC power wiring from the power distribution panel to the equipment shall utilize red insulated wires to identify negative voltages (hot), and black insulated wires to identify positive voltages (ground)

Metering shall indicate the output voltage amid total station load

The panel shall provide ample sized openings for entrance of cables, and internal space for bending of conductors and connection to circuit breakers. Cables shall be supported inside the cabinet on cable brackets, so that they do not put stress on circuit breakers or terminals

All tins plates arid circuit breaker connections shall be made of copper. DC bus plates shall be inside the cabinet and protected by doors or covers to prevent accidental shorting or grounding or injury to personnel.

DC output distribution should support the function of anti-battery reverse connection.

8.1.7. Low - voltage disconnect

Each power system shall include a low - voltage disconnect (LVD) device designed to protect batteries from damage when AC power remains off for more than the reserve time of the battery plant.

The LVD device shall sense the battery voltage, and open the battery circuit when the battery discharges to a preset voltage. The preset operating voltage shall be adjustable over a range which includes the manufacturer's recommended discharged battery cell voltage. Typical maximum discharged battery voltage and operating voltage of the LVD shall be - 42 VDC.

The LVD relay shall be connected in series with the battery, and not in series with the station load. Any failure of the LVD device or false operation of the disconnect relay shall not disconnect the station load.

The LVD relay shall be rated for at least 150% of the designed ultimate load of the power system.

It shall be possible to adjust and test the LVD device without disconnecting the battery or station load.

The LVD shall sense the restored voltage during recharge, and shall automatically reconnect the battery to the system.

DC output distribution should have load low voltage disconnection branches including two 100A circuit breakersand battery low voltage disconnection branches including two 63A circuit breaker in condition of cut off twice, two 32A circuit breaker and two 16A circuit breakers in condition of cut off once.

8.1.8. Battery Disconnect Breaker

The power system shall include a battery disconnect breaker in series with the negative (hot) side of the station battery.

The breaker shall be used for disconnecting the battery from the system for maintenance, and shall also protect the battery from damage due to any accidental short circuit in the power panel.

8.1.9. Battery Equalization

It is required by the battery plant, an automatic battery equalization system shall be provided as part of the power system. The equalization system shall be compatible with the battery plant, and programmable within the ranges of equalization recommended by the battery manufacturer.

8.1.10. Battery Type:

Batteries shall be the sealed maintenance - free type. Ventilation of the room where batteries are installed shall not be required. The designed service life of batteries shall be 10 years minimum.

8.1.11. Battery Installation

Batteries may be stacked using built - in rails, placed side - by - side, or mounted in a heavy duty steel battery rack according to the manufacturer's recommended installation methods.

All batteries shall be securely clamped or held in place, so that a battery cannot be accidently dislodged or moved causing shorts and/ or damage to the battery terminals, connector plates, or connecting cables. All battery racks shall be securely bolted to the floor.

8.1.12. Battery Cabling

Battery cables shall be properly sized for the rated load of battery plant All cables shall be insulated stranded copper conductors cables shall be installed in a manner that does not place stress on battery terminals and power panel connection. All cable terminals shall be crimp - on type and shall be installed using correct tools, terminal sizes, and die sizes.

8.1.13. Conductor Protection

All conductors, battery terminals, cable terminals, connector plates, arid hardware shall be thoroughly protected against accidental contact or shorting by the installation of removable battery covers, plastic guards or similar protectors.

8.1.14. UPS Power System Specification

An uninterrupted power system (UPS) shall be supplied to feed all AC equipment in the MOI. The proposed UPS should be suitable for ideal power supply for file server, enterprise server, computer, hub, telecom equipment and other devices demanding

high-quality power protection. The power capacity of the proposed UPS must be sufficient to power the equipment from a state of full battery drainage. The bidder must submit the power calculation to support this.

The proposed UPS must features digitalization, full high frequency, line-interaction, intelligence and network-orientation. It adopts state-of-the-art DSP (Digital Signal Processing), APFC (Active Power Factor Correction) and IGBT (Insulated Gate Bipolar Transistor) modules. The power conversion part must use the double conversion circuit and the real time sampling DSP controlled circuit to power the loads uninterruptedly.

The UPS must feature Line-interactive double conversion design, DSP technology and advanced APLL (Advanced Phase Lock Loop) to solve problems such as power failure, voltage drop, voltage surge, continuous under-voltage, continuous over-voltage, frequency fluctuation, power supply interference, switch instant changes and harmonic distortion. Wide input voltage reduces the number of battery usage, thereby prolonging the battery lifespan.

The UPS must feature battery discharging and termination protection voltage which can be automatically adjusted according to the loads, which prolongs the battery lifespan.

The UPS must feature input rectifier adopting BOOST circuit of APFC, making the input power factor reach 0.99, to enhanced the power efficiency and avoided harmonic interference to the grid.

The UPS must feature embedded CPU able to automatically adjust the running speed of the fan according to the internal temperature and output power to lower the noise and prolong the battery lifespan and save energy.

The UPS must feature Line-interactive double conversion design. No matter the mains supply is normal no not, the loads are powered by UPS inverter.

The UPS must feature Self-diagnosis offering complete fault self-diagnosis and communication function, which is convenient for maintenance and repair.

The bidder shall propose a UPS Power Management and Monitoring application at the center to monitor all the UPSs in the network. A demonstration at the equipment supplier factory shall be required based on MOI request prior to the start of the project official kick off date.

The UPS system shall consist of the following major equipment:

1. One input converter (rectifier)
2. One boost converter
3. One battery charger
4. One output converter (inverter)
5. One no-break static transfer switch
6. One maintenance by-pass switch
7. One battery bank
8. One main control panel with LCD display

The UPS system shall be able to operate in any of the following modes:

1. On-line Mode: During on-line operation mode, the UPS system shall be used to provide precise regulated and transient-free power to the connected loads. The input converter shall provide regulated DC power to support the inverter and simultaneously supply the battery charger to maintain the battery in a fully charged condition. The inverter shall convert the DC power into regulated AC power for the load.
2. ECO Mode: When the load does not require highest level of protection, the UPS shall be able to work in an energy saving mode. This mode shall be fully programmable to adapt it to the load and customer needs. When ECO mode is activated the UPS switches automatically to bypass as a function of the actual mains quality. In case of a mains imperfection (out of tolerances) the UPS seamlessly returns to 'On-line mode' without compromising the guarantee of total security for the critical load. This mode will not be activated unless specifically requested by on site.
3. Battery Mode: Upon failure of the mains- or utility supply, input power for the inverter shall automatically be supplied from the connected battery. When the mains is restored or the standby generator set supply is ready, input power for the inverter and for recharging the battery shall automatically be supplied from the rectifier. If the input does not return, the UPS shall automatically shut itself down in an orderly manner when the discharge limit of the battery is reached.
4. By-pass Mode - Upon the failure of static inverter, the no-break static transfer switch shall be activated automatically to isolate the faulty inverter and at the same time maintain a continuous supply to the system load. The automatic transfer mode shall also operate in the event of system overloading or if irregular or undesirable output for the load is detected. In this case, the system shall automatically return to the original on-line mode operation if the disturbance is cleared.
5. Manual By-pass Mode - If the UPS system needs to be isolated for service or maintenance, the maintenance by-pass shall transfer the load from inverter to the mains without interruption and vice versa

9. Installation Work

9.1. GENERAL

The following shall be covered under the installation work:

Installation, testing, handing over, commissioning and ensuring all the functions and facilities mentioned in specifications and the tenderer' s offer. Special attention should be paid by the tenderer while designing, installing, testing and commissioning the outgoing and incoming trunks in the offered system to and from the existing earth stations and international exchanges. The ministry will NOT carry out or permit any modifications in the existing exchanges equipment.

The contractor shall train MOI staff as specified in this document.

All installation work shall be carried out according to the methods approved by the Ministry. The contractor shall submit literatures, drawings, detailing the standard methods and practices being followed by.

For the period of the installation work, counter-measures for tropical conditions shall be sufficiently ensured.

Attention shall be paid to protection, particularly dust-proofing of the equipment.

9.2. TOOLS AND TESTING EQUIPMENT

The provision of all tools and testers required for the completion of the job, shall be the responsibility of the contractor. Such tools and testers shall remain the property of the contractor.

During installation, the contractor will not be allowed to use any of the equipment supplied for maintenance.

9.3. SUPPLY AND APPROVAL

All cables, wires, iron works, ladders and other material necessary for the installation, shall be supplied by the contractor to complete the whole project. The tenderer shall quote prices separately for each of these items and shall clearly state the basis of his calculation, in case these are supplied as 'lots'. Details of the different items comprising these 'lots' should also be given. As far as possible, the materials manufactured in Kuwait are to be used. Contractor should furnish a list of such materials.

9.4. QUALITY OF MATERIAL

All the installation material shall be of high quality, anti-corrosive and well finished with related international standards.

9.5. CABLES AND WIRES

The contractor shall furnish all necessary cabling, cable forms, and material (indoor cable, jumper wires, etc.) for the termination of all equipment provided and the interconnection of the racks. The racks that are initially not fully equipped shall be completely pre-wired in order to allow connection of additional equipment without extensive wiring or other means of connections.

The wiring and cabling used with the equipment, shall be of adequate size to meet the transmission requirements of these specifications and shall be arranged so as to prevent mechanical or electrical damage by any factor.

The insulation of all wiring and cabling shall consist of PVC or similar high grade non-inflammable non-dust producing material.

Tenderer shall indicate the types and specifications of cables and wires used. The following data shall be submitted by the tenderer:

1. Diameter of conductors.
2. Number of conductors.

3. Material of conductors.
4. Material and thickness of insulation.
5. Sheath thickness.
6. Overall diameter, color code.

9.6. INTERFACE CONNECTORS

The contractor shall provide details of the connectors and cabling required for each of the following:

Power connectors providing the connection from the equipment shelf to rack power distribution.

Alarm interface and alarm cabling from the equipment to rack alarm unit. Interface ports for external synchronization source Input. External synchronization output.

Electrical interface connectors.

Optical line connectors (shall be FC/PC connectors).

9.7. CABLE RUNWAY

The contractor shall supply and set up the cable runway and supports firmly for distribution cables.

The tenderer should give details of his standard methods of fixing the cables.

9.8. DISTRIBUTION FRAMES

The contractor responsibility to lay 75 Ohm unbalanced Coaxial cables between equipment and DDF equipment. Contractor shall submit specification of the coaxial cable to MOI for approval before commencement of installation. Moreover, the cable shall be tested for maximum length of the cable to transmit and receive 2Mb/s at a span 500meter length of the proposed cable. Cable shall be rejected after Failure of this test.

The contractor responsibility to lay 75 Ohm unbalanced coax cables between the offered equipment and MOI equipment after signing the contract.

Fiber cables shall be terminated in fiber distribution Frame by using FC/PC connectors.

9.9. LIGHTING ON THE RACKS

The contractor shall provide daylight fluorescent type lighting on all equipment rooms including the DDF, NMS Control room, and power rooms. The lighting shall be bright enough to meet work requirements of the maintenance staff.

Note: The Ministry will provide electric power outlet for installation.

9.10. ELECTRIC OUTLETS

Sufficient number of AC/DC outlets or equivalent shall be provided for maintenance purposes on both sides of equipment, and DDF racks.

9.11. SIGN-WRITING AND LABELING

All the equipment including cables, etc., shall be clearly sign written and labeled in English to enable easy identification. Such sign writing or labeling shall not be of temporary nature.

9.12. EQUIPMENT EARTHING

The necessary earthing shall be secured for protection and stable equipment operation. Tenderer shall state the maximum resistance of earthing permitted for the proper operation of the offered system.

9.13. PORTABLELADDERS & STOOLS

Sufficient number of portable ladders of suitable sizes and stools shall be supplied for maintenance by the contractor .

9.14. EQUIPMENT LAYOUT

9.14.1. General

Bidder is required to submit the proposed equipment layout plan specified here in after:

Floor Plan

1. It is desirable that layout proposed should occupy least possible space.
2. The Bidder shall submit dimensional floor layout plan for the initial and ultimate capacity.
3. Bidder is required to visit the sites and then to propose the dimensional floor layouts for the equipment room, DDF, power room, battery room, etc., for the initial and ultimate capacity of the system.

9.15. CABLE LAYOUT

9.15.1. Hand-holes, Manholes & Road Crossing Ducts

Hand-holes of a minimum width 450mm, length 1100mm and depth of 1100mm shall be supplied and installed by the contractor at all splice points and fence entrances to any existing facilities and at both sides of asphalt roads and road crossings. Hand-holes and manholes shall be constructed or prefabricated so as to comply with the pertaining standard specifications of MOC and shall be provided with a lockable steel cover and frame.

The contractor shall ensure that no hand-hole or manhole is located within 20meters distance of any road or utility crossing. Otherwise, there shall be an obstruction, Kuwait Municipality, Ministry of Public Works, Ministry of Internal, Ministry of Communication or Ministry of Electricity and Water, or Kuwait Oil Company decision.

MOI responsibility is to provide official letters to all Governmental Associations and help the contractor to get approval for starting the work for excavation from these Associations. The responsibility of the contractor is to follow this mater and take the final approval from these associations before starting the work.

The specifications of UPVC pipes for foot-way and road crossing conduits shall meet MOC specifications.

Where the contractor is required to affect a road or a road crossing the contractor shall carry out all the necessary excavation, backfilling and making good of existing surfaces, including road and pavement surfaces to the entire satisfaction of MOI, MPW and Municipality.

The contractor may be requested to lay 110 UPVC pipes wherever there is no free pipe (duct) to lay the proposed inner-duct for laying the duct-type fibre cable.

9.15.2. INNER-DUCTS

The contractor shall install four 32mm or 2x32 mm + 3x25mm HDPE inner ducts of different colors for optical cable runs embedded inside MOC existing 110mm UPVC ducts for feeder or distribution routes respectively.

The contractor shall install pulling lines in all inner-ducts. Unused inner-ducts shall be capped and sealed for future use.

All MOC conduits shall be man-drilled by the contractor prior to placing of inner-ducts.

9.15.3. WARNING TAPE

The contractor shall install a highly visible 6" (150mm) wide warning tape above the laid fibre optical cable. The warning tape shall be made from an approved weatherproof polythene material or similar material, with a bonded metallic tracer fitted to one side of the warning tape. The metallic tracer shall be galvanized steel wire.

The warning tape shall have a built-in ultra violet inhibitor capacity. Any adhesives to be used with the warning tape shall be of a silicon based manufacture.

9.15.4. Buried Cable Warning Posts

The contractor shall provide and install clearly visible warning posts at hand-hole locations along the route of the laid cable so as to identify the location and direction of the laid cable. The warning post shall identify the joint number. The warning post shall be installed at 200m intervals along the route of the laid cable and additionally at every curve and change in direction of the laid cable.

The cable route warning post shall be 2m in total length with 1 m buried underground when installed. The cable route warning post shall be installed by the contractor immediately upon backfilling of the cable trench.

The warning post shall be manufactured from approved material and shall be coated, colored lettered and otherwise marked so as to be resistant to the prevailing climatic conditions.

The material, wording, logo, color combinations and method of installation of the post shall be approved by MOI before their manufacture and installation.

9.16. PROJECT IMPLEMENTATION

9.16.1. Survey

Immediately after commencement of the works, the contractor shall carry out a detailed survey of the cable routes on the basis of the supplied cable route sketches and other associated information.

Details regarding the type and the depth of existing services which are found in the vicinity of the cable route shall be furnished in the survey reports and submitted for MOI approval. The survey shall normally be within 30m from the edge of the asphalted roads and at a minimum distance of 20m from existing roads and utilities.

The survey shall account for existing facilities, if any, such as buildings, AC power supply. Within the existing buildings, the contractor shall verify the floor space, height of ceilings, walls and the type of floor surface, so as to ascertain the buildings suitability for installation of the complete communication equipment, including the fiber cable termination frame, backup batteries, power system required and earth system at the station.

The contractor shall notify MOI in writing of any alteration or modification to the allocated buildings and areas that may be required for the installation of the system and equipment. If MOI considers the recommendations of the contractor are justified, MOI shall undertake to carry out the contractor recommendations or may otherwise direct the contractor to perform such modifications according to variation order.

Upon completion of the survey, the contractor shall submit the route and site survey reports, drawings and all other relevant information, including the delivery dates of the optical fiber cable for MOI review and approval.

Details and distances shown on MOI provided drawings are approximate and are not warranted by MOI. The contractor shall survey the route on the basis of these drawings, making measurements which will enable him to produce his own drawings to represent accurately the details for placing, splicing and terminating the cable.

9.16.2. Field Survey for Buried Cable

Based upon the drawings and information supplied or referenced by MOI, the contractor shall carry out a detailed survey, in order to determine accurate measurements for the purposes of the works. All existing underground utilities shall be located in order to determine the best center line of the new cable route and the depth of the new cable laying at anticipated points of conflict with other existing services. Locating such existing underground utilities shall be by the use of suitable electronic equipment and

ultrasonic equipment, together with the digging of trial pits around explored utilities. The contractor shall ensure that all precautions and safety regulations strictly followed while exploring for the buried utilities, so that no damage or injury is caused to any of the existing utilities or the manpower involved in such activities.

Upon locating such existing services, the contractor shall expose such services by the means of careful hand excavation and shall determine the kind of services located, their length and depth, and their possible impact in relation to the laying of the new optical fiber cable.

The contractor shall prepare and submit for review by MOI, detailed drawings showing existing underground services located and exposed by him, the recommended route, the center line, proper spacing and location of the cable joints and other relevant information prior to commencing any excavation

9.16.3. Excavation and Earth works

The contractor is advised that an excavation permit is required for all types of excavation at all areas. Likewise, no excavation works of any nature whatsoever shall be commenced by the contractor without the prior written approval of MOI.

The contractor shall be solely responsible for obtaining the excavation permit, signed by MOI representative, in accordance with the instructions written by MOI representative on the permit. After the issuance of the excavation permit, MOI will issue the necessary work permit to the contractor.

It shall also be unique responsibility of the contractor to ascertain and acquire all excavation or other work permits required for work in areas owned or administered by other government agencies, Ministries, or sites owned by MOC and MO Interior (Traffic Department).

Excavations shall be carried out as follows:

1. Hand excavation by using hand tools around existing utilities.
2. Excavation by machine excavator. As a rule long sections of the underground trench clear of buried services may be excavated by a machine excavator. Within 10m vicinity on either side of any underground services, the trench shall be excavated by hand for laying the cable.
3. Where other methods, procedures, or precautions may be required by other government agencies for work within restricted areas, public areas or interchanges, those requirements shall be so ascertained by the contractor. Such work shall be considered as within the scope of work.

The minimum width of the trench shall be 0.1 m and depth 1 m. In no case shall the width or depth of trench excavation be less than specified.

For asphalt cutting at road crossings the use of a compressor is permitted for excavation up to depth of 30cm only. All surfaces shall be restored to original or better condition by the contractor. Depths of over 300mm shall be hand trenched.

During excavation, all surfacing or foundation materials shall be carefully segregated from the soil. Any materials that are required to be reused during or after permanent reinstatement shall be carefully stacked.

Inconvenience to traffic due to excavation shall be avoided. The earth or other materials thrown up in the excavation shall be heaped in positions where they shall interfere least with the passage of pedestrians or vehicles. At road or highway crossings, adequate provision shall be made for traffic. Excavations shall be carried out on one half of one portion of the carriageway at any one time, leaving the other half available for traffic.

The contractor shall provide advance warning to vehicles and pedestrian of trenching, duct laying, or other related operations by placing warning signs of an approved type 100m on the oncoming side of the work area. Trenches along the carriageway shall not be left open overnight. If under exceptional circumstances this becomes necessary, advance warning shall be provided by flashing orange lights, supplemented by red lights every 10m along the length of excavation.

Any open trench shall not exceed 50cm in width. In high traffic areas, the open trench shall not exceed 100m in length.

The contractor shall be required to excavate in all types of soil and such excavation shall be considered as within the scope of work.

The contractor shall support the sides of open trenches with either timber or sheeting where the depth of the trench is more than 1m because of the nature of the soil or proximity of other services make this necessary. The contractor shall not claim charges for any extra quantity of excavations that shall be necessary by his failure to provide adequate timbering.

Great care shall be taken by the contractor to avoid undermining or otherwise disturbing existing pipes, cables. If despite precautions, such soil is disturbed, the services concerned shall be temporarily supported and the void filled with a concrete mixture of K- 140 at no extra cost to MOI.

9.16.4. Laying of UPVC Pipes

UPVC pipes shall be used at all asphalted road crossings and tarmac surfaces. 110mm pipes shall be laid at 1m depth at all such locations. The pipes shall be extended by 5m on either side from the edge of the asphalt.

Protection to all UPVC pipes used in road crossings shall be according to MOC standards. A K-140 concrete covering shall be placed over the entire length of the UPVC pipe. The concrete covering shall extend a minimum vertical distance of 20cm above the top of the UPVC pipe, and a minimum horizontal of 10cm on either side of the centerline of the UPVC pipe.

At the point of crossing of the cable with any existing services, the cable shall be suitably sleeved with 110mm UPVC pipe, in accordance with the followings requirements:

1. 2 x 110mm UPVC pipes shall be installed at crossings to utility which exceed 5m in total width.
2. 1 x 110mm UPVC pipe shall be installed at crossings to utility less than 5m in total width.
3. No UPVC pipe is required at a single utility crossing.
4. UPVC pipes are not required at temporary road crossings.

The contractor shall examine each pipe before laying. If any defective or broken pipe is laid it shall be the responsibility of the contractor to replace it with undamaged pipe.

All joints of UPVC pipes shall be pressed and made watertight with solvent cement, and shall be adequately sealed to prevent penetration. The jointing shall be to the satisfaction of MOI.

After backfilling, the pipes shall be checked for alignment and freedom from foreign materials by passing 2 brushes attached to the ends of a hard wooden mandrel, 300mm long and 90mm in diameter, followed be a cable rope, once in each direction, through the pipe. Pulling rope shall be installed in all spare ducts.

Both ends of all pipes shall be carefully sealed and made watertight by use of a suitable mechanical end cap and flexible rubber.

9.16.5. Laying of Cable

Before beginning of laying the cable, laying plan and the required equipment to be used shall be submitted by the contractor to MOI for approval.

Before the laying of the cable, the trench shall be inspected and approved by MOI representative.

Cables shall be laid directly into the trench as they come off the drums. A sufficient number of workmen shall be employed by the contractor to avoid pulling of the cable sheath on the ground.

At each location where a cable joint is to be made, sufficient extra cable length shall be left till the completion of the joint, an extra cable length of 15m on each side shall be coiled for making future joints. Slack coils of 30m shall be placed at intervals not exceed 2Km.

Due care shall be taken that the outer sheath of the cable is not damaged in anyway.

In the existing lateral ducts to the station buildings and all existing duct routes, the cable shall be installed through an inner duct. The inner duct shall be 3 each of 32mm or 2x32mm + 3x25mm (feeder or distribution route respectively and shall be supplied and installed by the contractor).

9.16.6. Backfilling of the trench

No backfilling shall be commenced before obtaining the approval of MOI.

Initially the trench shall be filled with a 10cm thick layer of selected soft soil free from stones. Having laid the cable on the soft soil, it shall be covered with soft soil on a depth of 20cm. The backfilling and compaction shall then continue in layers not exceeding 20cm.

All excavation materials shall be replaced in layers not exceeding 20cm in thickness after compaction. The required quantity of water shall be added in order to make the density of the soil correspond to the density of the soil around. Power rammers shall be used after 40cm of backfilling. The soil at the top shall be thoroughly compacted with a heavy power rammer to match the surrounding soil.

The contractor shall remove all surplus materials such as waste, broken ducts, and debris from the site and leave all affected areas and surfaces in a clean and proper condition to the satisfaction of MOI. The contractor shall furnish a certificate that all surplus materials have been cleared after the completion of the works.

Reinstatement of the surfaces with asphalt, concrete and/or tiles shall be executed by the contractor. The contractor shall prepare solid compaction for reinstatement of those surfaces.

The contractor shall maintain a daily basis, the level of each crossings and footpaths affected by the cable laying, by filling as necessary until resurfacing is achieved.

9.16.7. Cable Installation

The contractor shall provide all installation hardware, fittings, supports, fasteners, and other materials required at all existing or new manholes/hand-holes in compliance with MOI and MOC standards.

All fiber optical cables shall be secure, designated and tagged at splices, hand-holes and terminals.

The contractor shall submit a description of each type and location of splice.

All splices shall be of the fusion type and shall be made within watertight re-enterable splice enclosures which are designed specifically for the splicing of the optical fiber cable.

All wayside splices shall be installed within manholes and hand-holes.

MOI reserves the right to reject any sub-standard wayside splice.

All fibers shall be spliced through at all locations. All fibers shall be tested and recorded in the As-Built documentation.

The contractor shall install every run of wayside cable in accordance with the manufacturers recommendations for the respective type and make of cable and in compliance with this Technical Specification. Pulling tension, side pressure, bending

radius and other parameters governing cable installation practice shall at all times be held within the limits approved by MOI.

Quantitative monitoring by the use of tension indicators, pulling dynamometers shall be practiced and recorded while the cable is being pulled through. These records shall be part of the As-Built drawings.

10. TESTING

This section defines the tests to be performed, and the criteria and requirements for test planning, performance, recording of data and reporting of test results.

The contractor shall perform all work necessary for planning and executing the required tests, and for completing the required documentation.

10.1. Acceptance Testing for Optical Fibre Cable

The optical fibre cable shall be tested for attenuation characteristics and continuity of the fibre before laying of the cable with optical time domain reflect meter (OTDR). The print out of the OTDR shall be submitted as a part of test result documentation; therefore, OTDR shall be equipped with a printer.

Optical lengths. The measurement is performed with the technique of back scatter, by setting the refractive index of the fibre in its extent. It should carry out the measurements of the optical lengths progressive to joint sand / or sectioning intermediate from a terminal on a fibre taken as a reference for the whole section, closed joint. It will also measure the optical length of the section from terminal to terminal. All measurements must be recorded in drawing in dicating the length of the strap used.

Check the insulation resistance (tools: tester, insulation tester, for example Megger). To test the insulation resistance to ground is necessary to apply a reference voltage(i.e. 500V) and after 5 minutes the measured values should not be lower than the reference resistance (i.e. 5ohmsx km). This measurement must be done in a single test on entire system (dorsalor treats), including possible branches.

The cable shall be tested again for attenuation and continuity after laying the cable to confirm that there is no variation in the attenuation parameters. The OTDR print out shall be submitted as a part of test result documentation.

1. The measurement is performed with the technique of back-scattering, which must be carried out bidirectional at a wavelength appropriate to better highlight any attenuation due to macro bending.
2. The measures for the attenuation of joints must be taken after joints disjunction is completely finished. During testing, the Contractor should perform the measure on all the fibres and bidirectional splices.

The cable shall be spliced by using arc fusion splicing machine. Fibre splice loss shall be measured from both ends. The fibre splice loss of the fibre in the link shall be less than

0.03dB. The OTDR print out for all the fibres and for each joint shall be submitted to MOI, therefore OTDR shall be equipped with printer.

End to end link loss test shall be measured for each fibre by light source and power meter which shall be less than the power loss calculated theoretically. These test results shall be submitted as part of test result documentation.

MOI may or may not witness the tests as mentioned in 1,2,3,4. But this does not relieve the contractor from the responsibility of providing the fiber link as per the specifications required.

Four or five sub-ducts shall be pulled inside MOC existing ducts of different colors with pulling string inside each. The number sub-ducts shall be fixed properly with proper no number sub-duct holders at each manhole and each hand-hole. The empty sub-ducts shall be covered with proper sub-duct cap all shall be subjected to MOI approval.

The cable shall be fixed properly on the walls of the manhole. A 15meter length of cable shall be coiled on each side of the joint. The average distance between MOC manholes is 120 meters.

Effective labels shall be used to identify the cable at each manhole.

Inside MOI building complex the cable must be terminated at Radio MCC, TV MCC and Microwave MCC.

Inside Transmitting Stations the contractor shall build new hand-holes with 2-way ducts. The distance between hand-holes shall not exceed 150 meters.

At the time of survey of the Direct buried cable (DBC) the contractor shall find out all existing utilities underground and shall fix Red Post over all utilities as a warning before installation of the DBC.

During installation of the DBC the contractor shall make manual excavation at the points of found underground utilities. If the utilities are less than one meter depth the contractor shall pull the DBC underneath.

After install of one drum of DBC (6Km approx.) or less the contractor shall install pre-cast hand-hole with inlet and outlet pieces of PVC ducts according to MOC specifications and shall make joint inside it with slack coil of l5meter at each side of the joint.

10.2. Testing of installed optical fibre cable

Using OTDR to check each terminated fiber.

End to end attenuation.

To do this with a suitable optical Transmitter and measure with an optical power meter.

OTDR test results are not enough.

All fibers shall be tested in both directions.

10.3. Test Program

The test program shall span all three (3) stages of the general classifications of tests and shall reflect the overall objective of each classification of test as follows:

10.3.1. Design Verification and factory Tests

To establish that each individual item of equipment, sub-assembly or material, which can be tested independently of the rest of the system/assembly, is tested at the manufacturer's premises and meets with the manufacturer's published data and the Technical specification where applicable.

To establish that when the individual items, subassemblies, assemblies and material are amalgamated to form a sub-system or simulated system, that each subsystem or simulated system is tested and meets with the MOI's requirements and the Technical Specification.

Sample or batch testing of identical items of equipment shall be performed by the contractor as requested by the MOI.

The contractor shall furnish certified test reports for each assembly at the time of delivery.

10.3.2. Installation Verification Tests

Prior to Operational acceptance testing the contractor shall establish that each part of the system which can be tested after installation and independently of the rest of the system, meets with the MOI requirements and Technical Specification. Ideally the tests performed should mirror the Operational acceptance Tests as far as is practicable within the constraints imposed by the installation program.

10.3.3. System acceptance Tests

To establish that the entire system operates effectively and complies with the MOI requirements and technical specification.

The test program shall contain the following information:

1. Test plan
2. Test schedule
3. Individual test procedures
4. Test data sheets
5. Test results.

10.4. Test Plan

The plan shall be submitted not later than ninety (90) days after the Commencement Date and shall include but not be limited to the following:

List of all test procedures by route, facility, subsystem and overall system within each general classification of tests contained in 5.3.1.

Identification of each specified design and performance requirement, with the method of verification used i.e. measured, calculated, visually inspected and so on.

Test constraint and acceptance and rejection criteria.

Identification of all test equipment to be used, including model types and technical specification.

Identification of any company furnished material, personnel or equipment, together with details on any access to the MOI facilities that will be required.

10.5. Test Schedule

A test schedule shall be submitted by the Contractor with the test plan and shall include but not be limited to the following:

A schedule of tests by route, facility, sub system and overall system for each general classification of test as detailed above. This schedule shall be compatible with the contract master schedule and shall be updated and submitted weekly.

The overall schedule of tests to be performed shall be based on forecast site availability data. The schedule shall identify the type, duration and sequencing of each and all tests.

Detailed sub-schedules itemizing tests performed at each location shall be prepared where required.

The MOI may assign one or more witnesses to observe test and attest to the recording of data. If the MOI assigns a witness for a particular test, that test shall proceed only with the witness present.

The MOI may assign observers to watch the test on a non-participating non-interfering basis.

10.6. Individual Test Procedures

The individual test procedures shall be submitted ninety (90) days before the commencement of each test.

The individual test procedures shall be formatted so as to allow the inclusion of test results and witnessing by the MOI Engineer. Procedures for each test identified in the test plan shall, as a minimum, contain the following:

1. A unique test title number
2. A statement of objective, scope and procedure
3. A list of equipment required to set up and perform the test procedure.
4. A list of equipment, services or facilities that are required and are outside the contractor's ability to provide.
5. A list of prerequisite tests that must be completed before the procedure can be performed.
6. A brief description of the desired procedure set up, including diagrams of the test equipment connections which identify any test points as applicable.

7. Step by step instructions for performing the procedure identifying the points at which data is to be recorded, the expected test results and the limits of acceptable data.
8. Instructions for recording pertinent test conditions and environment of test.
9. Pass/fail criteria
10. Test data sheets.

10.7. Test Data Sheets

As part of each test procedure the contractor shall prepare standard and specific test data sheets.

Standard data sheets shall be used to record applicable drawing numbers, test equipment serial numbers and calibration dates where applicable, discrepancies and corrective actions if required; and to report the completion of a test.

Specific data sheets shall be designated to record test data or to verify test items peculiar to each test. Data entries shall be referenced to the applicable procedure and the allowable limits for each entry shall be indicated on the data sheet. Data sheets shall be arranged in tabular form where practical.

10.8. Test Results

Reports of test results shall be submitted for each test procedure. The individual test procedures shall be formatted to allow the recording of test results. Test results shall include but not be limited to the following:

The name of the test and test procedure reference number and revision level.

The identification of the subsystem or equipment tested including but not limited to nomenclature, part number and serial number of each component involved in the test.

The place, date and time when the test is performed.

A description of the test environment which shall include the approximate humidity, temperature, dust conditions and other environmental factors.

Identification of all test equipment actually used in the test.

Completed data sheets.

A description and explanation of test failures, abnormalities or other deviations from the expected results.

A list of circuit drawings and/or arrangement plans used during testing.

A signature (s) of the person (s) conducting the tests.

A signature indicating the Contractor's safety engineers approval that the test satisfies the system safety requirements, and signatures of the MOI and his representative when applicable.

A list of documents that have been revised due to corrections or modifications.

Recommendations and authorization for remedial action and retest.

Failures detected during testing and corrective action taken shall be listed on standard data sheets and be included in the test results

11. Spares & Tools

The bidder shall supply critical spare parts sufficient to cover uninterrupted operation of the supplied solution for the three year warranty period. (The bidder should provide a detailed plan of scheduled maintenance with material and equipment to replace or to clean):

1. Equipment Electronic modules sufficient for two years maintenance
2. 4 kmof optical fiber cable in 1 drum for Duct Cable as used in this project
3. One drumof optical fiber cable for Direct Buried Cable as used in this project

Types and quantities of all the spares submitted shall be listed with unit price.

The contractor shall not use MOI spares during the warranty period. After the end of the warranty period MOI will replenish all consumed spares during the two years Maintenance period. All Repaired equipment and modules shall be returned to MOI spares stock and the history of the unit shall be update.

The tenderer shall supply and price the following measuring equipment and tools needed to test and maintain the network. The bidder shall utilize his own test and measurement tools.

Latest portable Mini OTDR with Multimode / Single mode package, dual wavelength (1310 / 1550 nm) long haul shall be offered (10)Ten sets.

Latest portable laser Light Source shall be offered (10) ten sets.

Latest sensitive portable Power Meter shall be offered(10) Ten sets.

Latest portable Variable Attenuator shall be offered (10) Ten sets.

Any measuring equipment and tools needed to test and maintain the network not mentioned and necessary or special for the network.

12. Documentation

The bidder shall submit the following documentation (all in English) at least:

1. Installation, Operation, and Maintenance manuals for all equipment.
2. Details of MTBF (Mean Time between Failures) and MTTR (Mean time to repairs).
3. Component and system data, able to better define the operation, maintenance and troubleshooting.
4. Details and datasheet on type, model, technical feature of each equipment and offered material (cables, etc.)

5. Document can be provided in one of the following file types: .doc, .xls, .ppt, .pdf, .dwg.
6. List of critical components, defined as those components whose failure interrupts service or undermine its redundancy.
7. Details of the Disaster Recovery Process.
8. Software Operator and Administrator Guide.
9. Equipment Layout, DDF Layout, Power equipment Layout.
10. Bay-Face Layout of all Racks and Sub-Racks.
11. Maintenance statistics.
12. Time Schedule: the bidder shall submit a detailed time schedule showing Signing of the contract, Manufacturing of each type of equipment and cables, Factory
13. Test of each type of equipment and cables, Shipment of each type of equipment and cables, arrival of each type of equipment and cables, Submittal of each type of equipment and cables to MOI stores, breakdown of each type of installation stage and time of completion for each station separately.
14. Installation Precautions and Installation Methods.
15. Installation Test and Acceptance Test Procedure.
16. Maintenance Routines and Schedules.
17. Details of Maintenance Duties.
18. The Life-Time of the Laser Diode.
19. Prices for Equipment & Spares must be held for 5 years.

Documents to be submitted by the Contractor.

The following to be submitted after signing the contract for approval MOI:

1. Detailed installation Work schedule.
2. Equipment Shipping Schedule (This schedule shall indicate the time of factory inspection, and the time of shipment and the address of the factory).
3. Equipment Drawings in details.
4. Optical Fiber Cable Color Code.

To be submitted two months before commencement of installation:

1. Final Design & Layout of all equipment
2. Installation Work Diagrams
3. Factory Test Data.

The following to be submitted before PHOC:

1. Overall System Description
2. Hardware and Software Manuals.
3. Operation Manuals.
4. Maintenance Manuals.
5. Installation Manual

13. Bills of Quantities (B O Q)& Price Schedule

Bill of Quantities

Item No..	Description	Qty	Unit Price K.D	Total Price K.D
1	System Engineering & Design			
2	Testing and commissioning			
3	36 Months Guarantee for the entire network			
4	System Integration			
5	Project Management & Engineering			
6	Concrete Encase 2 Way Duct Bank			
7	Optical Fiber Cable (include + Spare)			
8	Direct Buried Route			
9	Duct Route			
10	Transmission System			
11	Codec's Systems			
12	Content Monitoring System			
13	Power System			
14	Network Manag. Sys (include all sub-systems)			
15	Disaster Recovery System			
16	Installation			
17	Spares Prates& Tools			
18	Training			
19	Operations, Maintenance			
20	Additional Equipment or works that are required to complete the system but not mentioned in the above specification and any extra cost materials not clearly mentioned above.			

21	**Grand total**	

 # Note 1 : The bidder must give details for each item, cost, etc.

 # Note 2 : The bidder must in his commercial offer detailed list of equipment for each (item), chapter included itemized price and no optional prices accepted all tender must be in total price for each chapter this is must.

 # Note 3 : Any items/works not mentioned in the previous pages and/or the attached B.O.Q. but indispensable for proper installations / implementations/performance of the different sub-systems of this project MUST be inserted, described and priced in the relevant schedule/s. Otherwise, these items/works shall be provided/done free of any charge to MOI, before PHO.

Appendix A: Sites

Sites coordinates obtained from Google earth				
Ministry locations & Transmission Stations				Signal direction
1	MOInfo Complex	Lat 29°21'44.80"N	Long 47° 58'21. 95"E	Bi-direction
2	Liberation Tower station	Lat 29° 22'6.89"N	Long 47° 58'30.90"E	Towards + Tele line
3	Shuwaikh site	Lat 29° 19'5.75"N	Long 47° 57'26.71"E	Bi –direction
4	Salmiya site Lat	Lat 29° 19'47.92"N	Long 48° 4'56.70" E	Bi-direction
5	Subiya Station	Lat 29° 35'21.32"N	Long 47° 54'45.46"E	Towards + Tele line
6	Mutla'a Station	Lat 29° 24'18.57"N	Long 47° 39'4.98"E	Towards + Tele line
7	Kabd Station	Lat 29° 8'43.53"N	Long 47° 46'5.49"E	Towards + Tele line
8	West G1 station	Lat 29° 18'34.77"N	Long 47° 53'28.11"E	Towards + Tele line
9	G1 station	Lat 29° 19'1.45"N	Long 47° 54'51.78"E	Towards + Tele line
10	Magwa station	Lat 29° 10'51.01 "N	Long 48° 2'39.67"E	Towards + Tele line
11	South Subahiya Station	Lat 29° 4'47.04"N	Long 48° 6'15.82"E	Towards + Tele line
12	Julya'a Station	Lat 28° 51'50.07"N	Long 48° 11'36.37"E	Towards + Tele line
13	Kuwait National Assembly	Lat 29° 37'057 "N	Long 47°	Bi-direction + Tele line
Stadium coordinates				
14	Jaber ALAhmed Stadium	Lat 29° 16'9.96"N	Long 47° 55'7.71"E	Backward
15	Alarabi sport club	Lat 29° 21'27.34"N	Long 47° 59'57.02"E	Backward
16	Qadsia sport club	Lat 29° 20'25.11"N	Long 48° 1'48.09"E	Backward
17	Kazma sport club	Lat 29° 19'43.69"N	Long 47° 59'13.04"E	Backward
18	Kuwait Stadium	Lat 29° 20'32.92"N	Long 47° 57'5.05"E	Backward

Appendix B: Standards

ID	Standard	Description
1	ITU-T G. 652D	Characteristics of a single-mode optical fibre cable
2	ITU-T G. 653	Characteristics of a dispersion-shifted single-mode fibre
3	ITU-T G. 655	Charac. of a non-zero dispersion shifted single-mode fibre
4	ITU-T G. 661	Definition and test methods for the relevant....
5	ITU-T G. 663	Application related aspects of optical ....
6	ITU-T G. 691	Optical interfaces for single-channel STM-64 and other ...
7	ITU-T G. 692	Optical interfaces for multi-channel sys with op. amplifiers
8	ITU-T G. 703	Physical/electrical characteristics of Hierarchical ....
9	ITU-T G. 704	Synchronous frame structures used at 1544, 6312, 2048...
10	ITU-T G. 706	Frame alignment and CRC procedures relating
11	ITU-T G. 707	Network node interface for Synchronous Digital
12	ITU-T G. 773	Protocol suites for Q-interfaces for management ....
13	ITU-T G. 774	SDH management information model for the network.....
14	ITU-T G. 774. 01	SDH-bi-directional performance monitoring ....
15	ITU-T G. 774. 02	SDH - Configuration of the payload structure for ....
16	ITU-T G. 774. 03	SDH - Management of multiplex-section protection
17	ITU-T G. 774. 04	SDH - Management of the sub-network connection....
18	ITU-T G. 780	Vocabulary of terms for synchronous digital hierarchy
19	ITU-T G. 781	Structures of recommendations on multiplexing equipment
20	ITU-T G. 782	General characteristics of the SDH multiplexing
21	ITU-T G. 783	Characteristics of synchronous digital hierarchy
22	ITU-T G. 784	Synchronous Digital Hierarchy (SDH) Management

	ITU-T G.798	OSC as per G.798
23	ITU-T G. 803	Architecture of Transport networks based on SDH
24	ITU-T G. 805	Generic functional architecture of transport networks
25	ITU-T G. 810	Definitions and terminology for synchronization networks
26	ITU-T G. 811	Timing characteristics of primary reference clocks
27	ITU-T G. 812	Timing requirements of slave clocks suitable ....
28	ITU-T G. 813	Timing characteristics of SDH equipment slave clocks (SEC)
29	ITU-T G. 823	The control of jitter and wander within digital networks
30	ITU-T G. 825	The control of jitter and wander within digital networks
31	ITU-T G. 826	Error performance parameters and objectives ....
32	ITU-T G. 831	Performance and management capabilities of transport
33	ITU-T G. 832	Transport of SDH elements on PDH networks:
34	ITU-T G. 841	Types and characteristics of SDH network protection
35	ITU-T G. 842	Interworking of SDH network protection architectures
36	ITU-T G. 957	Optical interfaces for equipment and systems relating
37	ITU-T G. 958	Digital line systems based on the synchronous digital
38	ITU-T G.7041	SAN services should be encapsulated with GFP-T
40	ITU-T G.8261, G.8262, G.8264	Synchronous Ethernet standards
41	ITU-T G.8010)	Ethernet Physical Layer network.
42	ITU-T G.8032v2	Ethernet Ring Protection
43	ITU-T Y.1413	CESoPSN according to RFC 5086
44	ITU-T Y.1731	MPLS-TP OAM
45	ITU-T K. 41	Resistibility of internal interfaces of telecomm....

46	ITU-T M. 20	Maintenance philosophy for telecommunication networks
47	ITU-T M. 2100	Performance limits for bringing-into-service.....
48	ITU-T M. 2101	Performance limits and objectives for .....
49	ITU-T M. 2120	PDH path, section and transmission system ....
50	ITU-T M. 3010	Principles for a Telecommunications management network
51	ITU-T M. 3400	TMN Management Functions
52	ITU-T Q. 811	Lower layer protocol profiles for the Q3 and X interfaces
53	ITU-T Q. 812	Upper layer protocol profiles for the Q3 and X interfaces
54	ITU-T Q. 921	ISDN user-network interface - Data link layer specification
55	ITU-T V. 11	Electrical characteristics for balanced ....
56	IEEE 802.1D (2004)	Telecommunications and information .....
57	IEEE 802.1ad	Telecommunications and information .....
58	IEEE 802.1ag	Telecommunications and information exchange.....
59	IEEE 802.1AX-2008	Link Aggregation
60	IEEE 802.1Q	IEEE Standard for LAN & MAN NETWORKS ....
61	IEEE 802.1u	Maintenance changes (corrections to main .1Q standard)
62	IEEE 802.1s	Multiple Spanning Tree Protocol (MSTP)
63	IEEE 802.3 (2003)	Information technology—Telecommunications.....

64	IEEE 802.3ah	Telecommunications and information exchange ....
65	IEEE 802.3u (1995)	100BASE-T (FE)
66	IEEE 802.3x (1997)	Full-duplex and flow-control
67	IEEE 802.3z (1998)	1000BASE-X (1GE)
68	IEEE 802.3ae (2002)	10Gbps operation (10GE)
69	RFC 2819	Remote Network Monitoring Management Information Base
70	RFC 3270	MPLS Support of Differentiated Services
71	RFC 3350	RTP (Real-time Transport Protocol): a Transport.....
72	RFC 3916	Requirements for Pseudo-wire Emulation Edge-to-Edge
73	RFC 3985	Pseudo Wire Emulation Edge-to-Edge (PWE3) Architecture
74	RFC 4385	Pseudowire Emulation Edge-to-Edge (PWE3) Control.....
75	RFC 4448	Encapsulation Methods for Transport of Ethernet .....
76	RFC 5317 (February 2009)	JWT Report on MPLS-TP (Architectural Considerations)
77	RFC 5462	MPLS EXP field renamed to Traffic Class field
78	RFC 5586	MPLS Generic Associated Channel
79	RFC 5654	Requirements of an MPLS Transport Profile

80	RFC 5718	In-band DCN using G-Ach
81	RFC 5860 (May2010)	Requirements for OAM in MPLS-TP
82	RFC 5860 (June2010)	Bidirectional Forwarding Detection (BFD).....
83	MEF 4	Metro Ethernet Network Architecture Framework.....
84	MEF 6	Ethernet Services Definitions Phase 1
85	MEF 8	Implementation Agreement for the Emulation .....
86	MEF 9	Abstract Test Suite for Ethernet Services at the UNI
87	MEF 10, 10.1	Ethernet Service Attributes Phase 1, Phase 2
88	MEF 11	User Network Interface (UNI) Requirements and Framework

APPENDIX C: MAP